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TIMES OF SUNRISE AND SUNSET IN THE UNITED STATES

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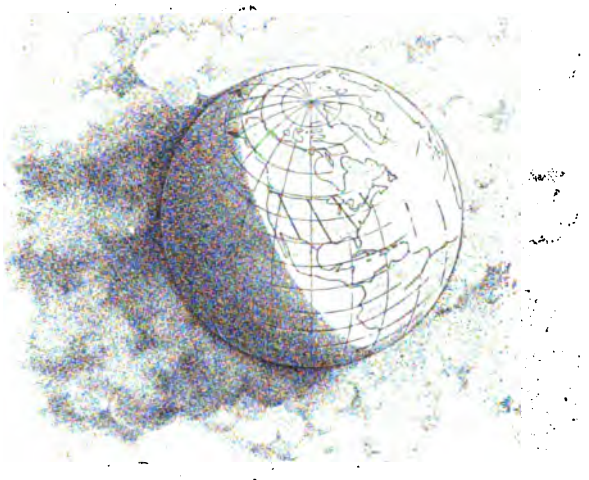
ROBERT WHEELER WILLSON

Professor of Astronomy in Harvard University



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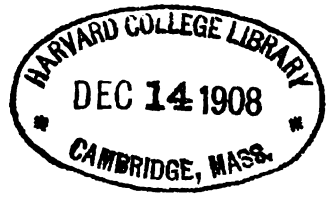

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SUNRISE AND SUNSET

The upper map on each of the following pages is to be used for finding the standard time of sunrise for the date printed at the head of the page, at any given point of the United States; the time of sunset may be found from the lower map.

The time is in each case Central Standard Time and is **read off directly from the map** by means of the "time lines" drawn upon it.

The line "VI" on the upper map is drawn through all those points where the sun rises at 6 A. M. of Central Standard Time, and the number at the top of any line gives the standard time of sunrise at all places on that line. The time thus shown is the instant at which the sun's upper edge appears to be exactly on the horizon.

The following rules apply to both maps:

Rule 1. *If the point for which the time of sunrise or sunset is desired lies* **exactly on one of the time lines**, *the required Central Time is read directly from the upper end of the line.*

Rule 2. *If the point lies* **between two lines** *the required time lies between the times of the two lines and proportionally nearer to the time of the nearer line.*

Rule 3. *If* **Eastern Time** *is required one hour must be* **added** *to the time as read from the map. For* **Mountain** *and* **Pacific** *times* **subtract** *one and two hours respectively.*

The process will be best explained by the following illustrative examples, all of which refer to places whose positions are marked upon the map.

On the sunrise map for January first the dot which represents Springfield, Ill., lies upon the line of 7h. 20m., which is the time of sunrise at that place on the first of January of each year. On the same date the time of sunrise at Toledo, O., is exactly 7 o'clock, and at Des Moines, Ia., 7h. 40m. The position of Springfield on the sunset map for the same date is **just**

half way between the lines of 4h. 40m. and 4h. 50m., and the time of sunset is 4h. 45m. In the same way the sun sets at Toledo at 4h. 15m. and at Des Moines at 4h. 55m.

Chicago on the sunrise map lies about eight tenths of the way from the 7h. 10m. to the 7h. 20m. line, hence by rule 2 the sun rises at 7h. 18m. The lower map shows that sunset is at 4.31.

By the same method we find that at Denver the sun rises on the first of January at 8.20 and sets at 5.46; but as Denver keeps Mountain Time rule 3 requires the subtraction of one hour from these times, making them 7.20 and 4.46 respectively.

At San Francisco (Pacific Time) sunrise and sunset are at 7.25 and 5.02 (two hours have been subtracted as required by rule 3).

Rule 4. *If no map is given for the date in question take the time from the map next preceding, and also from the map next following the given date. The required time lies between the two values thus found, and is proportionally nearer to that for the nearer date.*

To illustrate rule 4 we may find the time of sunset at Boston on Jan. 6 as follows:

Jan. 1, 3.23 Central or 4.23 Eastern Time.
Jan. 9, 3.30. " " 4.30 " "

The difference is 7 minutes or $\frac{7}{8}$ minutes per day. The interval from Jan. 1 to Jan. 6 is 5 days, and we must add $5 \times \frac{7}{8}$ minutes or $4\frac{3}{8}$ minutes to the time for Jan. 1, giving for sunset at Boston Jan. 6, 4h. 27m.

The lines are so drawn on the maps as to be correct for the second year following a leap year (1906, 1910, etc.); the error in any other year does not reach one minute except in the following cases:

In leap years, from **Feb. 15 to Feb. 29**, and again from **Aug. 15 to Nov. 1**, **sunrise is later** and **sunset is earlier** than the time found by the maps. The amount is less than half a minute in the southern part of the country, but rises to about a minute at the northern boundary.

From **March 1 to May 15** in leap years **sunrise is earlier** and **sunset is later** by one minute in the Northern and by about half a minute in the Southern States.

Upon each map are shown by small dots all cities having, in 1900, a population of more than twenty-five thousand, except where confusion would result from their closeness to each other. The state capitals are represented by somewhat larger dots.

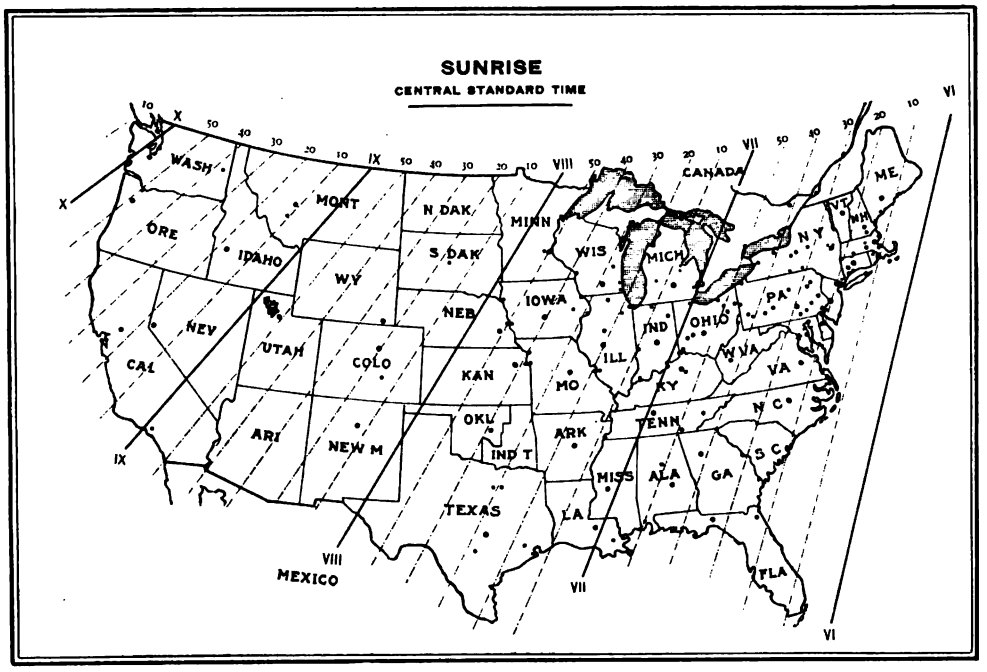
To use the maps for any place not so indicated, it is best actually to place a dot in its proper position on the map.

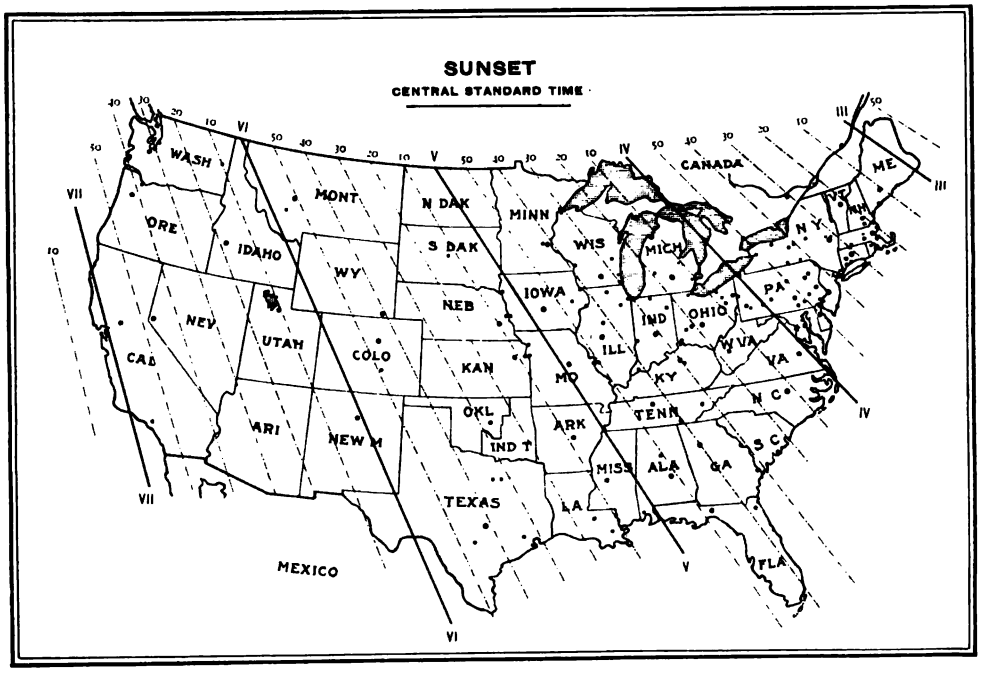
If the latitude and longitude are known, the dot may be inserted by means of the "auxiliary map" following the maps of Dec. 31.

For this purpose put a small piece of transparent paper on the auxiliary map and trace the outline of the state. Put the dot in its proper place by means of the lines of latitude and longitude. Then apply the tracing to each of the dated maps in turn, fitting it to the state lines as closely as possible, and press on the dot with the point of a pencil hard enough to make a dent; remove the tracing and put an ink dot in the depression.

To most persons these maps will appeal merely as a curiosity, but they may sometimes serve a useful purpose in finding the error of a watch where it is possible to note the time of sunrise or sunset over a body of water so extensive that its visible limit appears to meet the sky, but in comparing the time actually observed with the time found from the map it should be remembered that in the United States to a person 130 feet above the water level the sun appears above the horizon a full minute earlier and sets a full minute later than if the observer were at the water's edge. At heights of 500, 1200, 2100, 3300 feet the difference amounts to 2, 3, 4, 5 minutes respectively.

JANUARY FIRST





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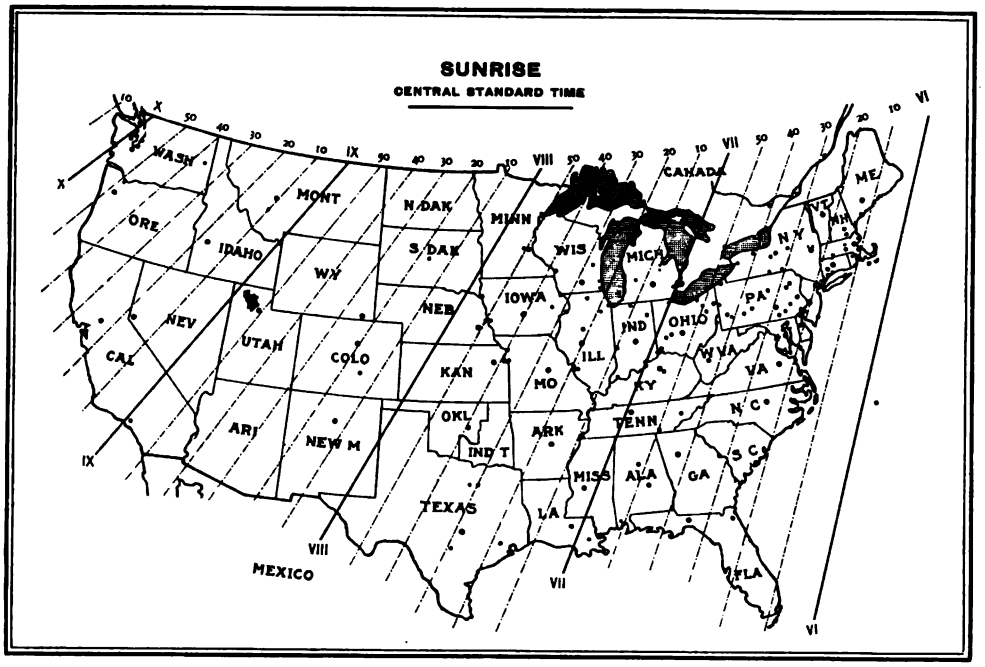

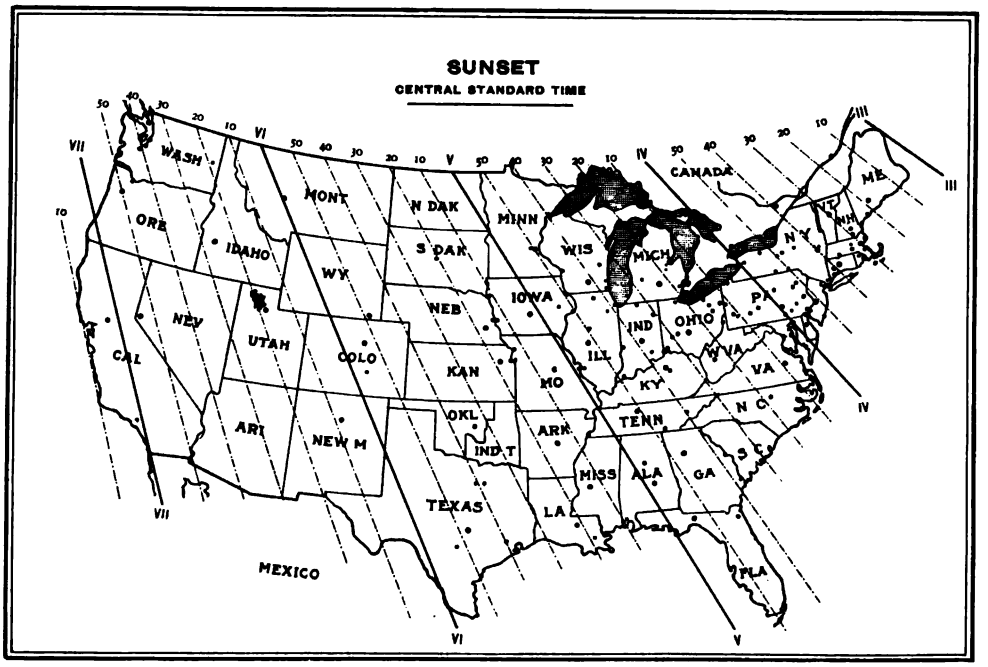

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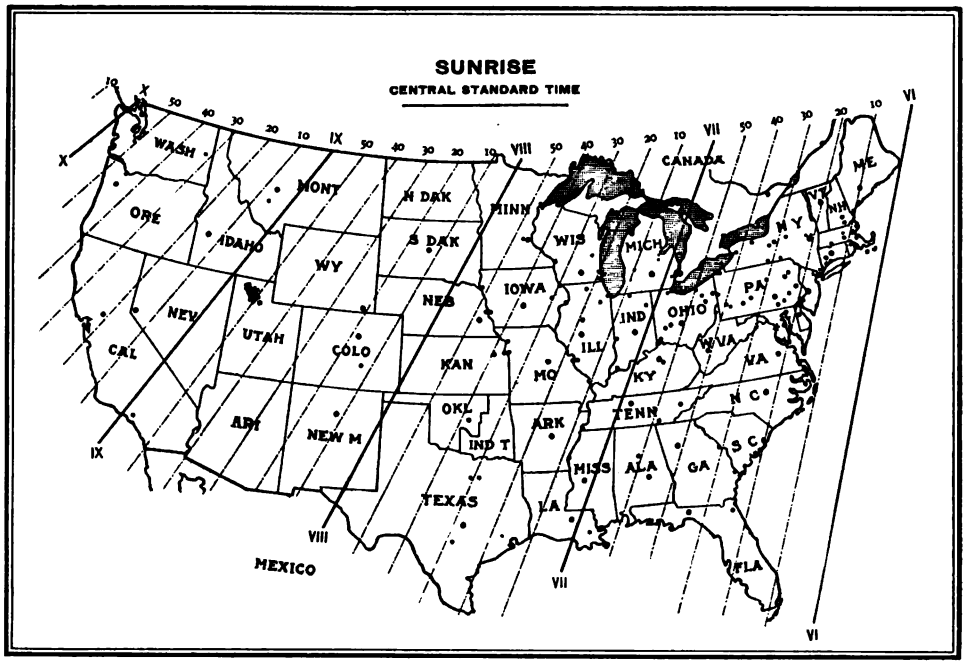

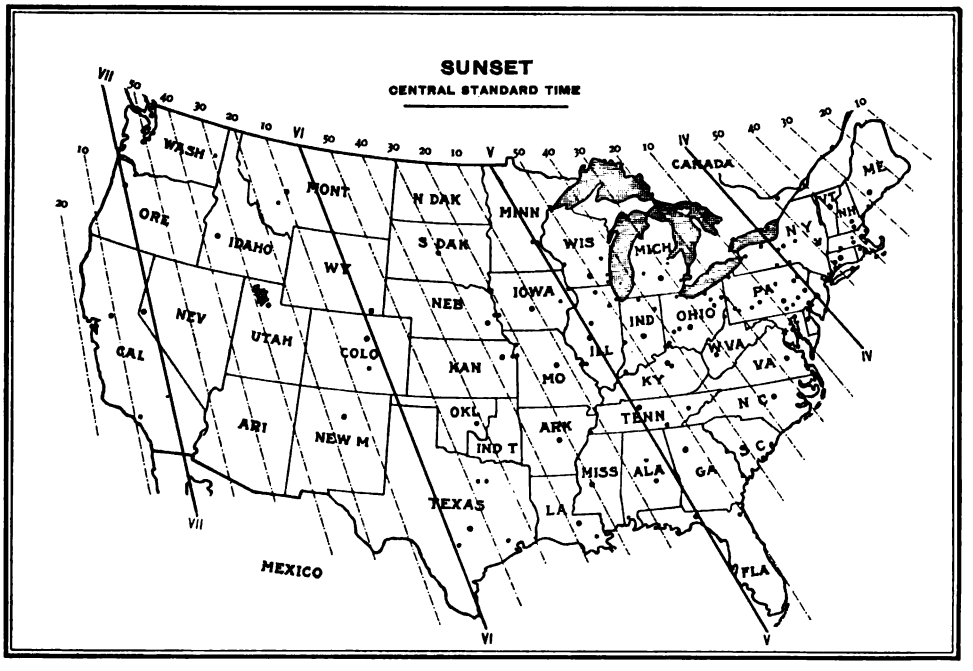

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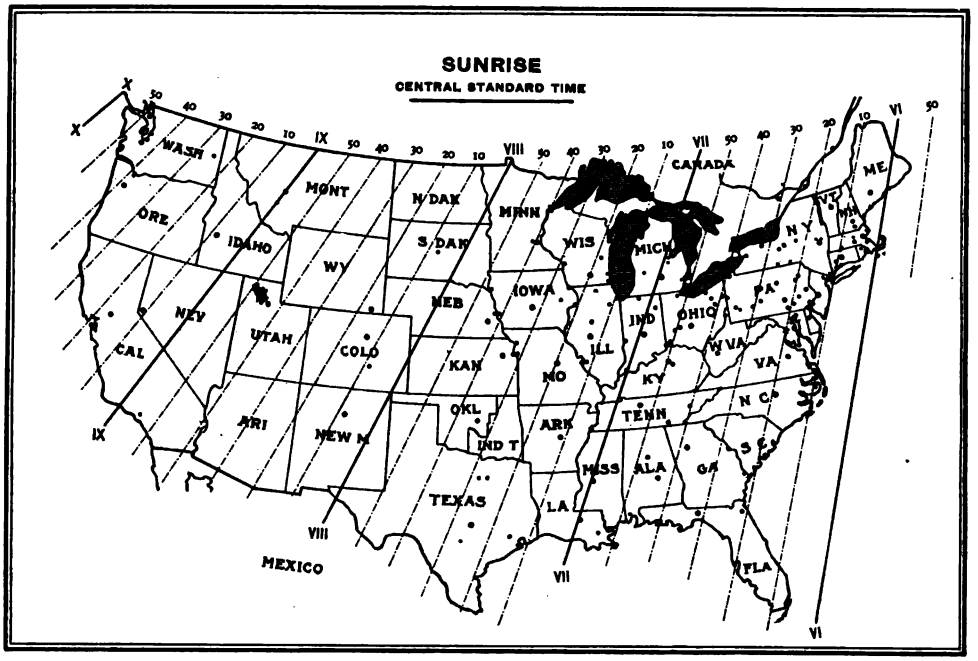

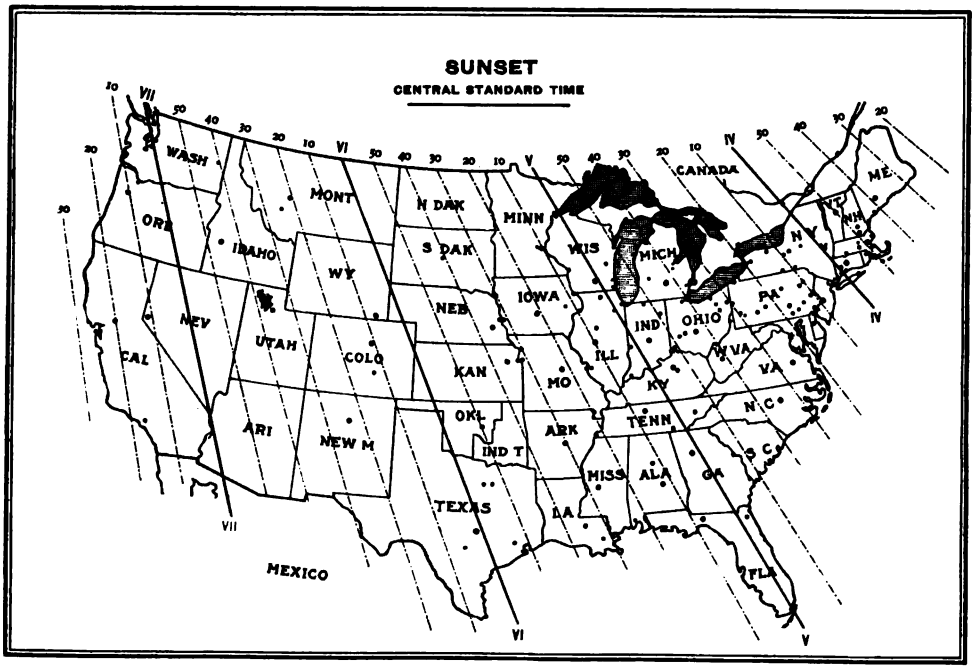

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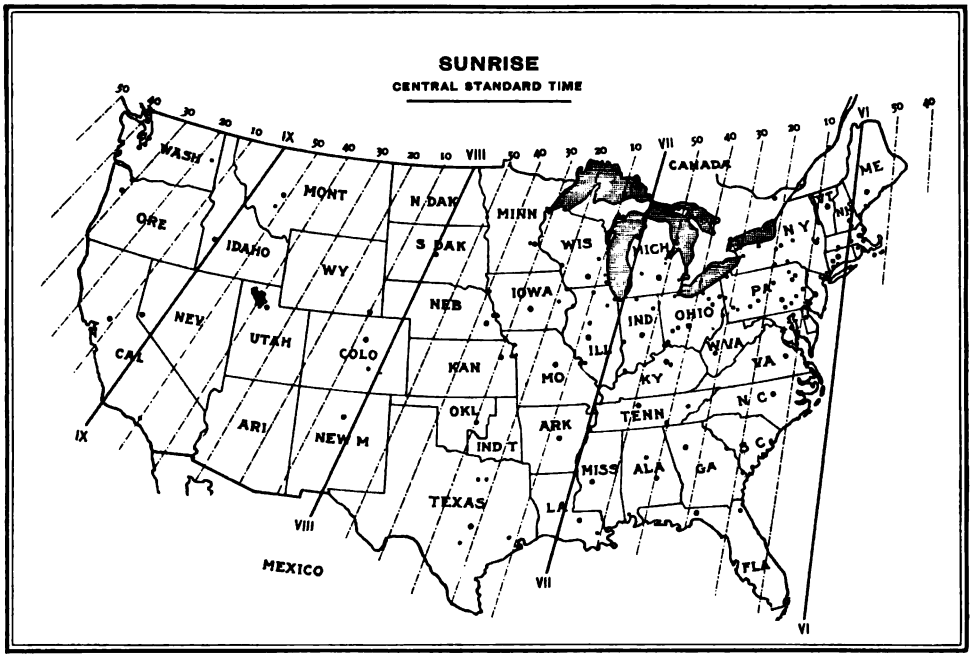

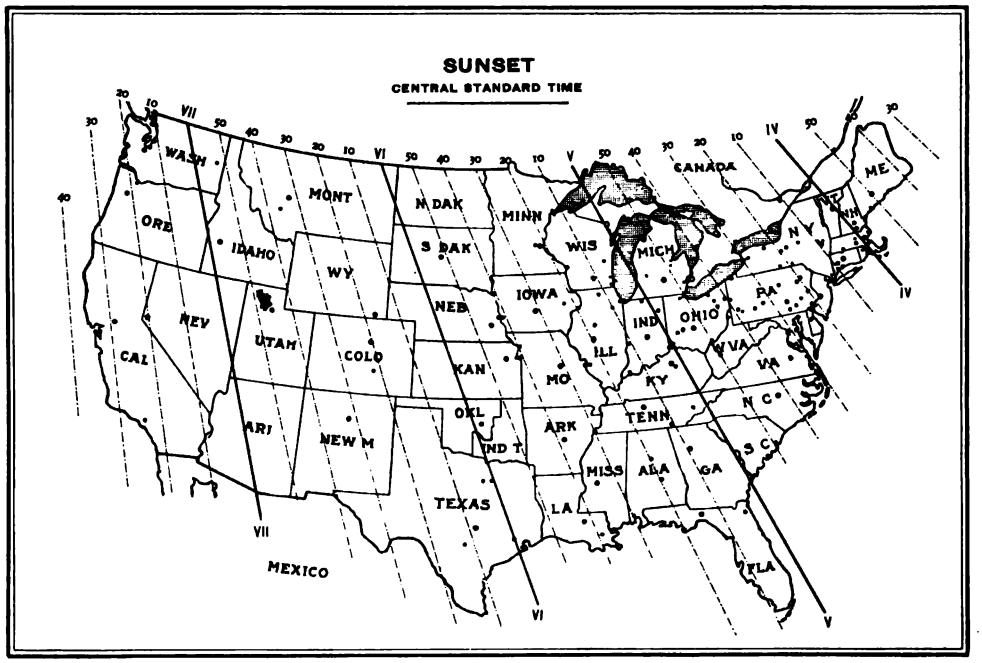

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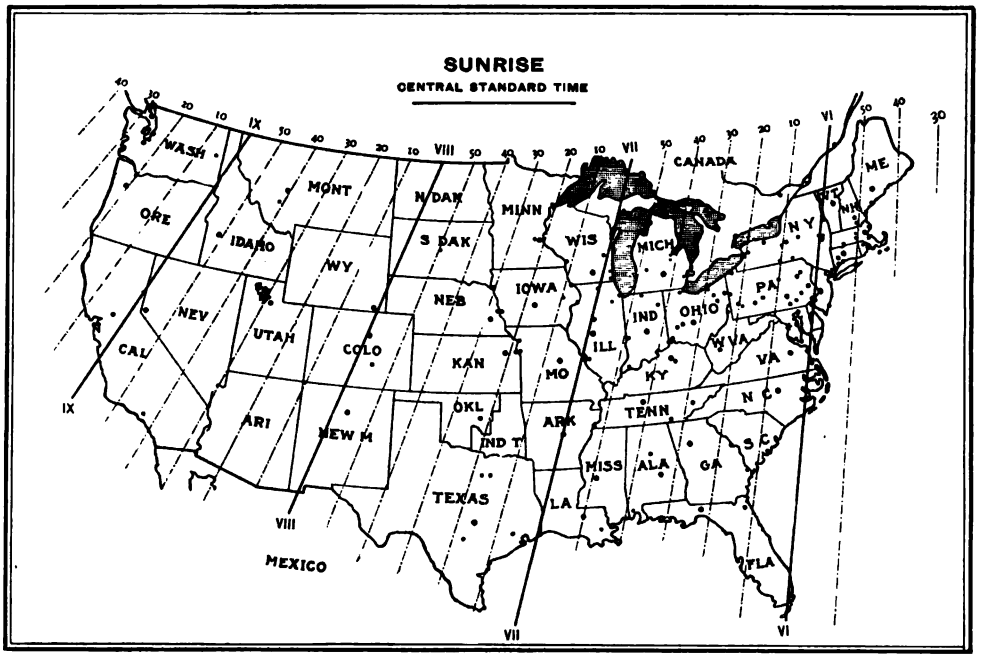

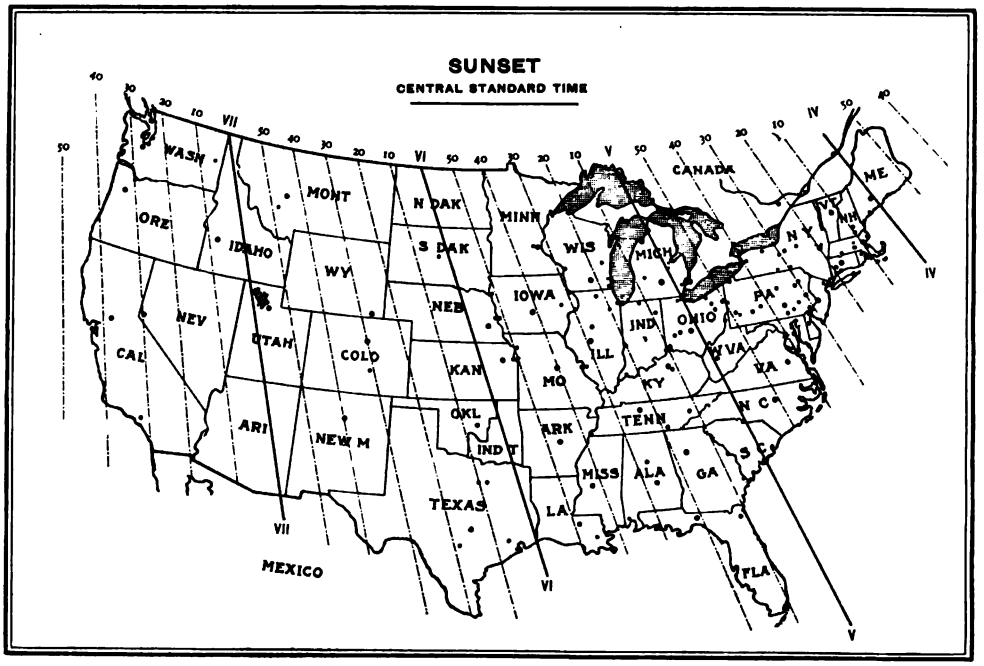

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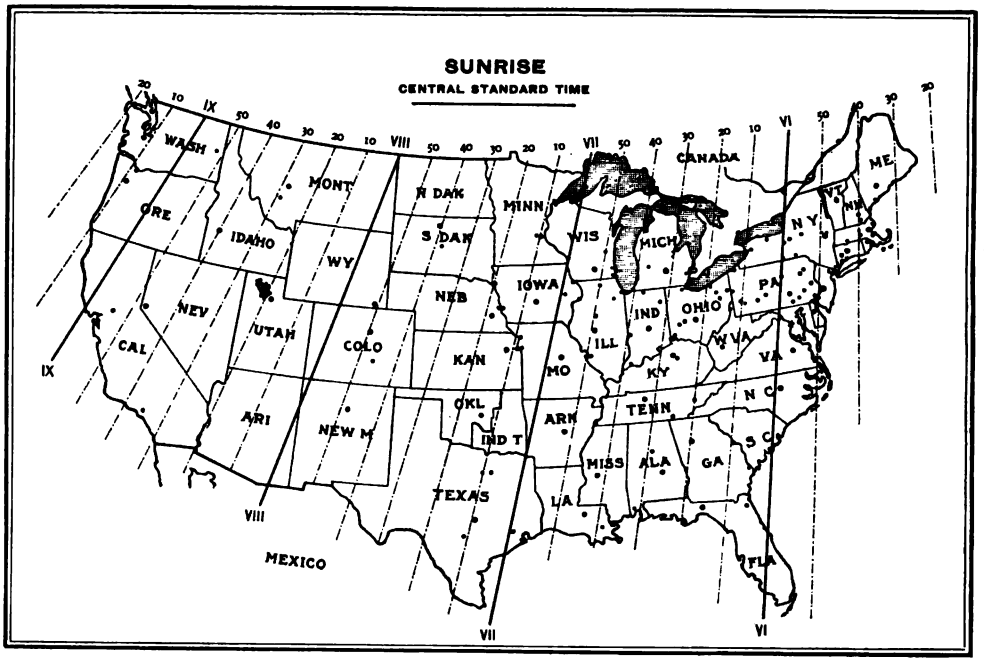

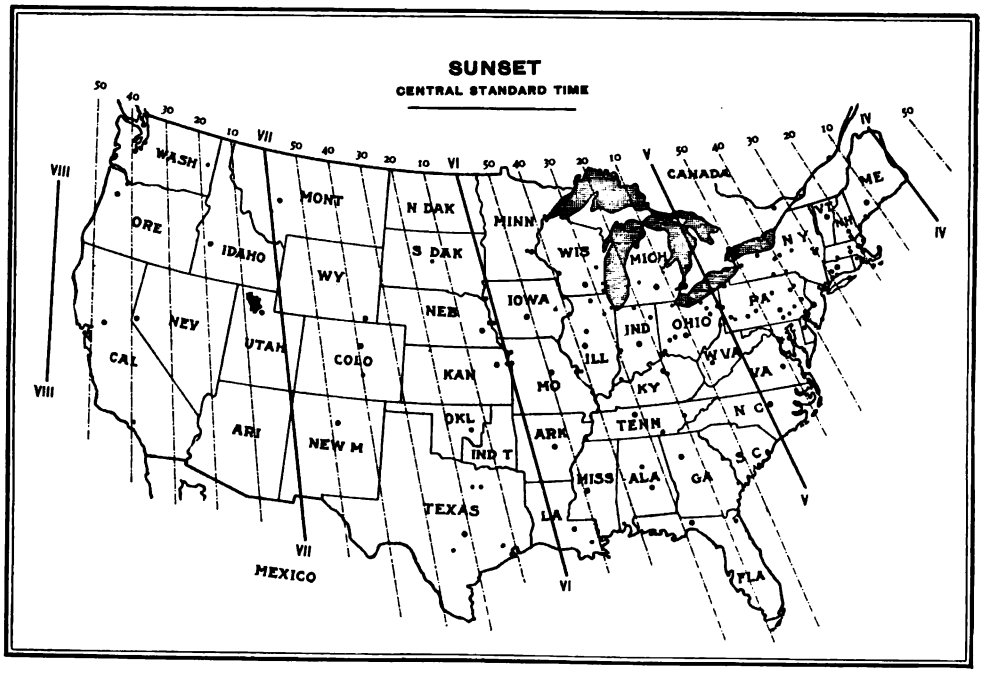

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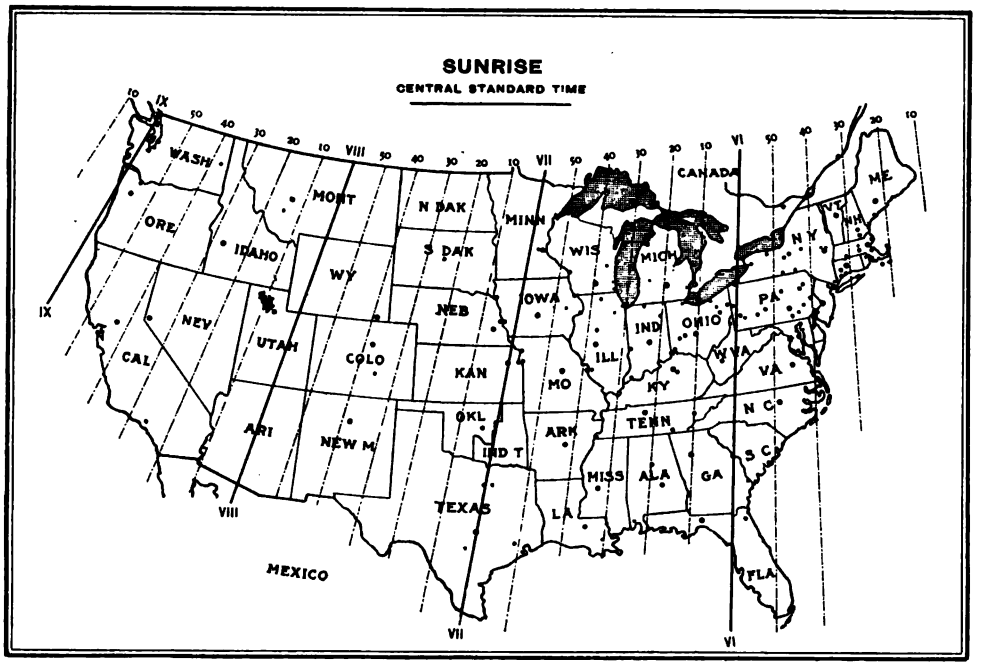

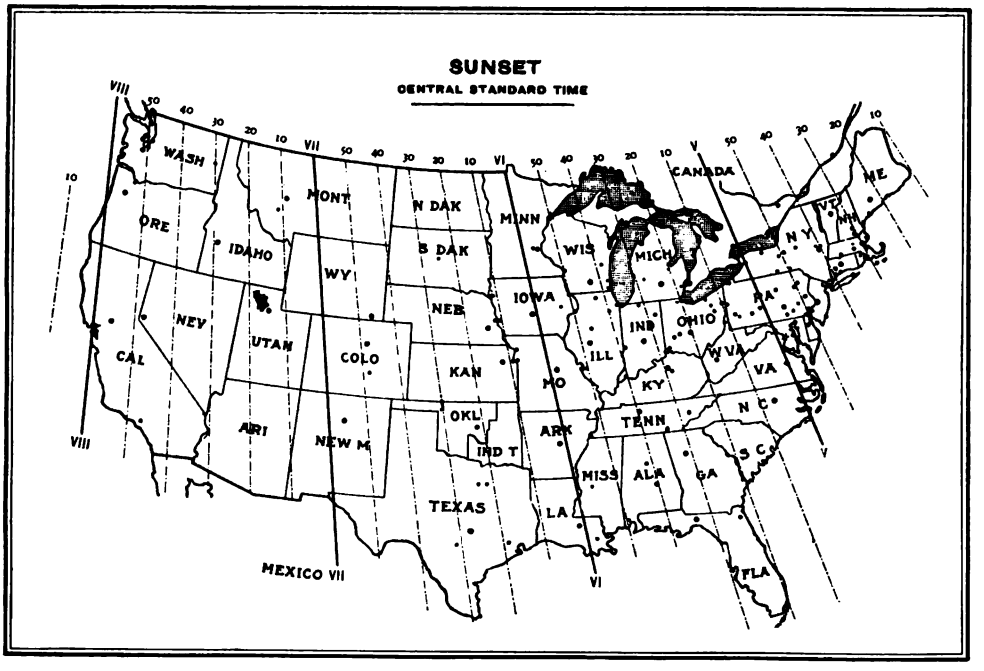

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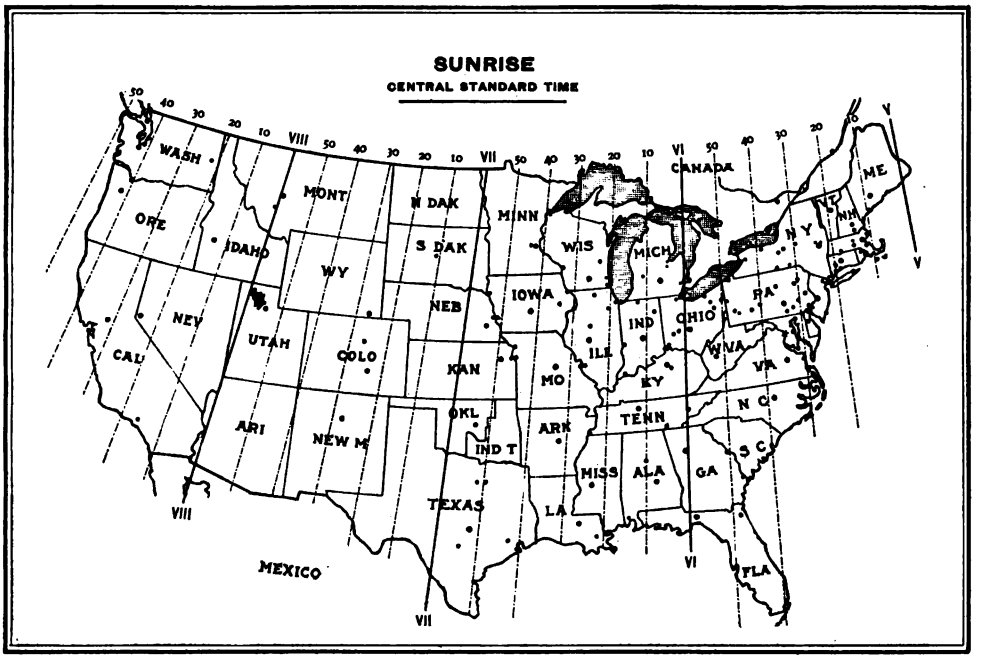
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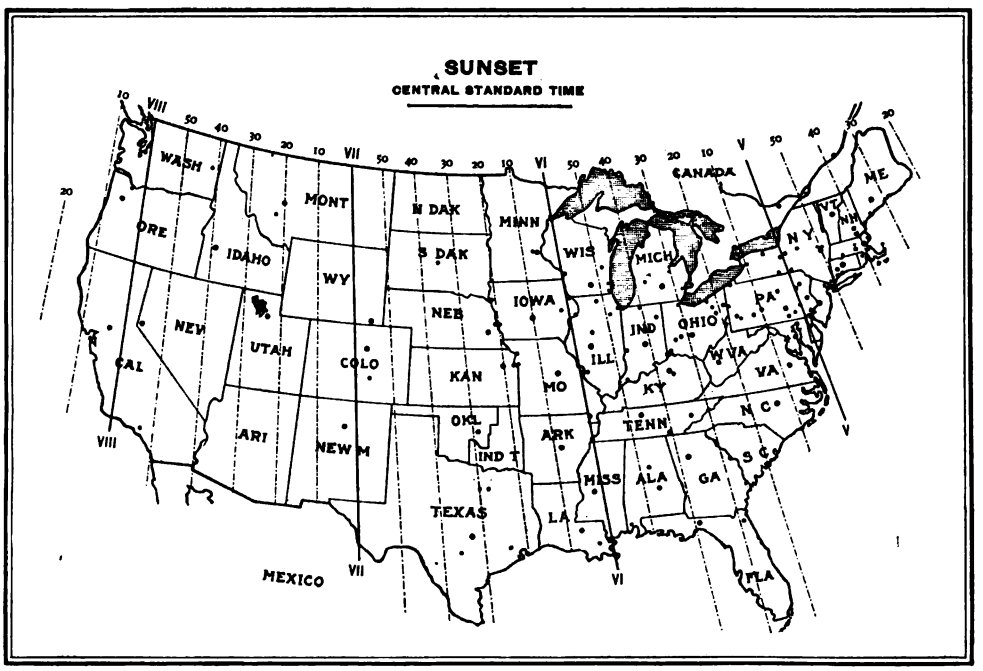
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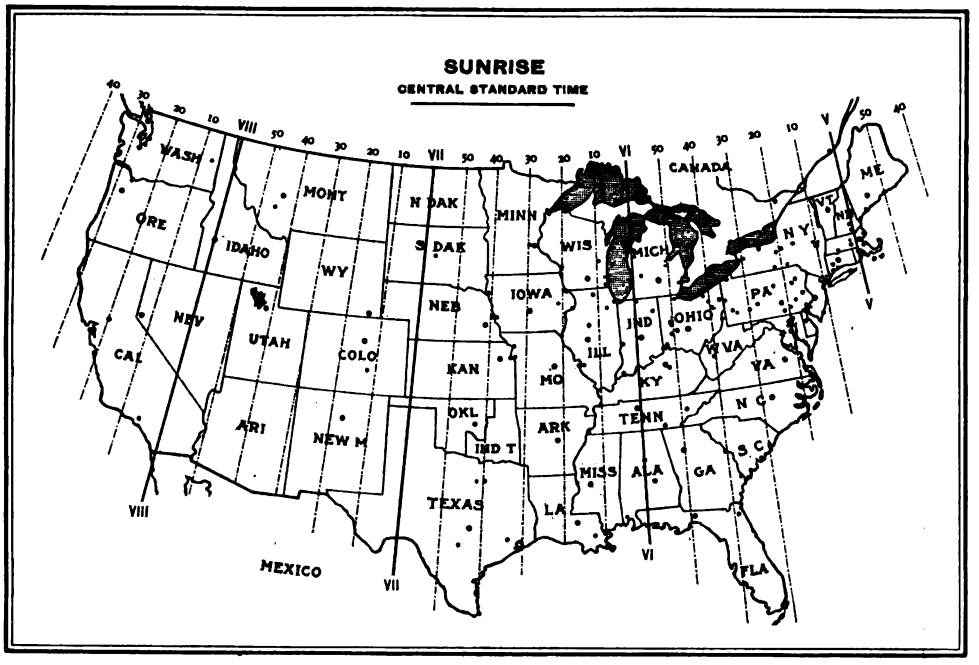

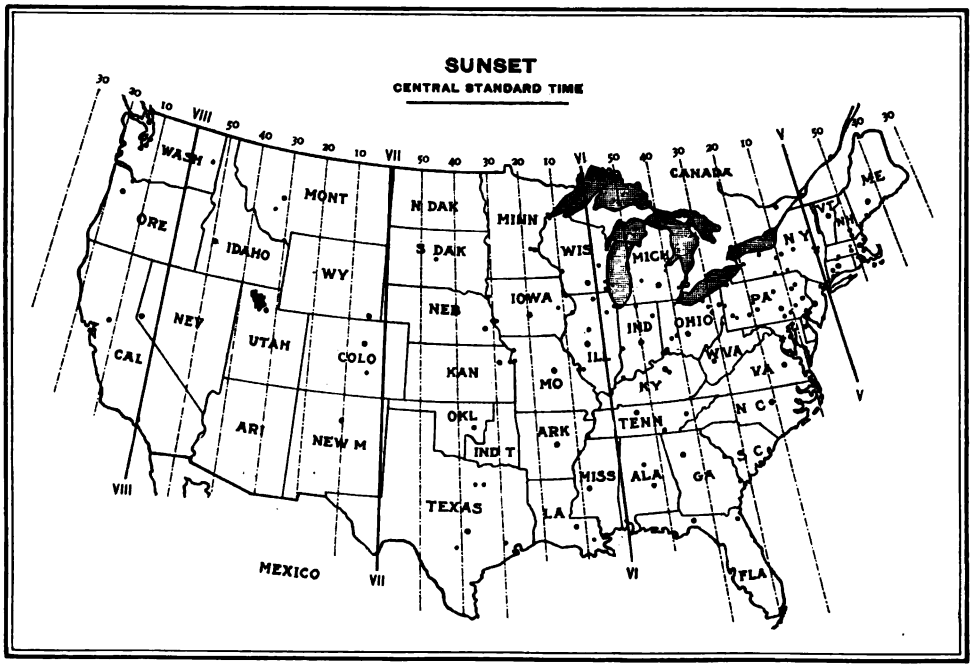

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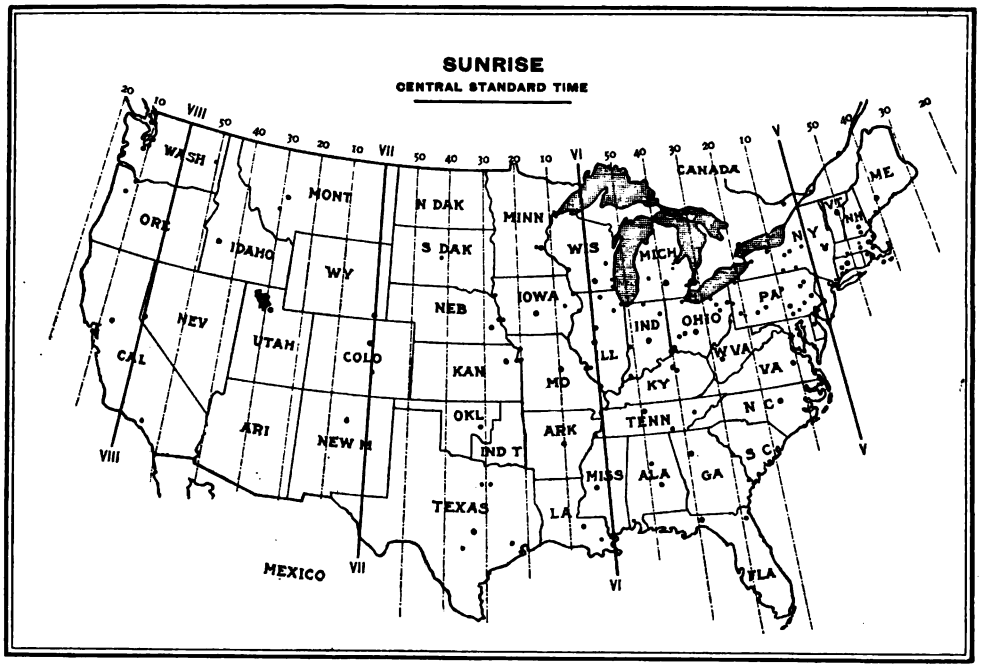

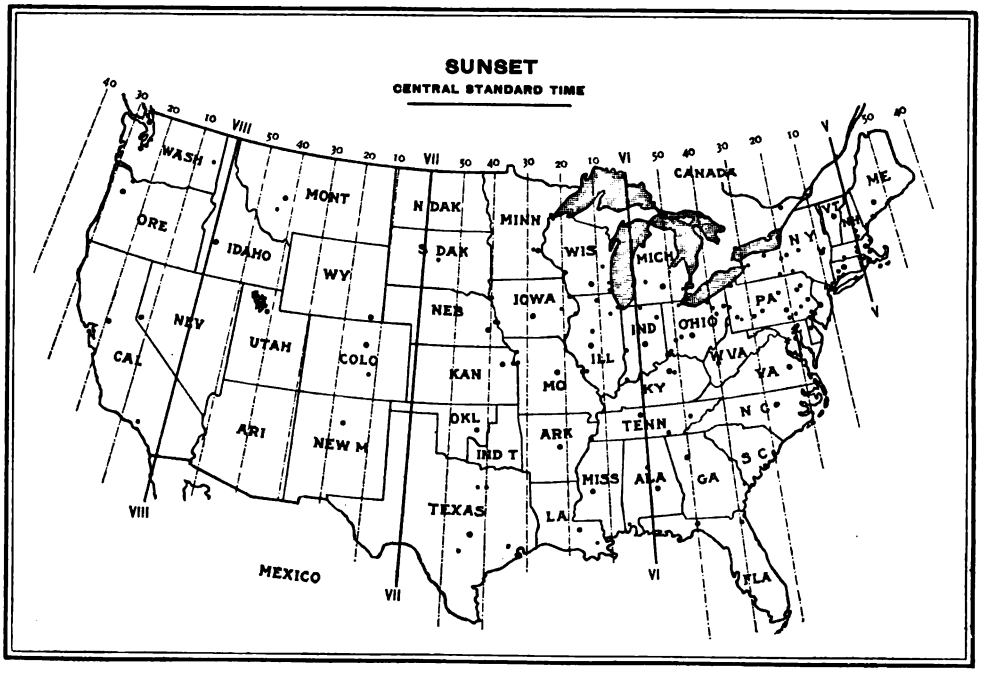

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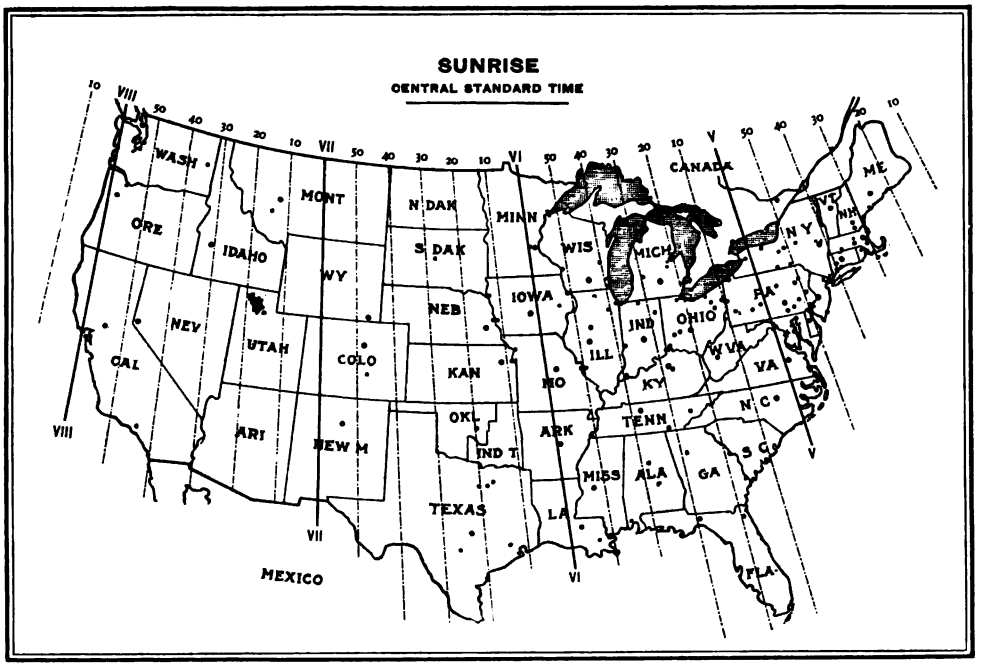

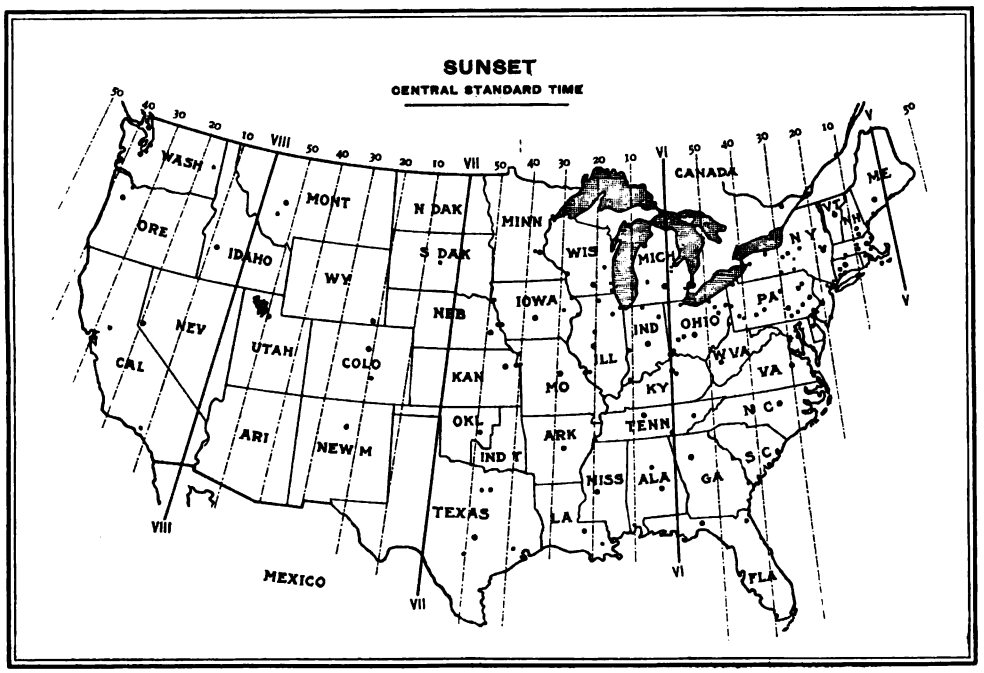

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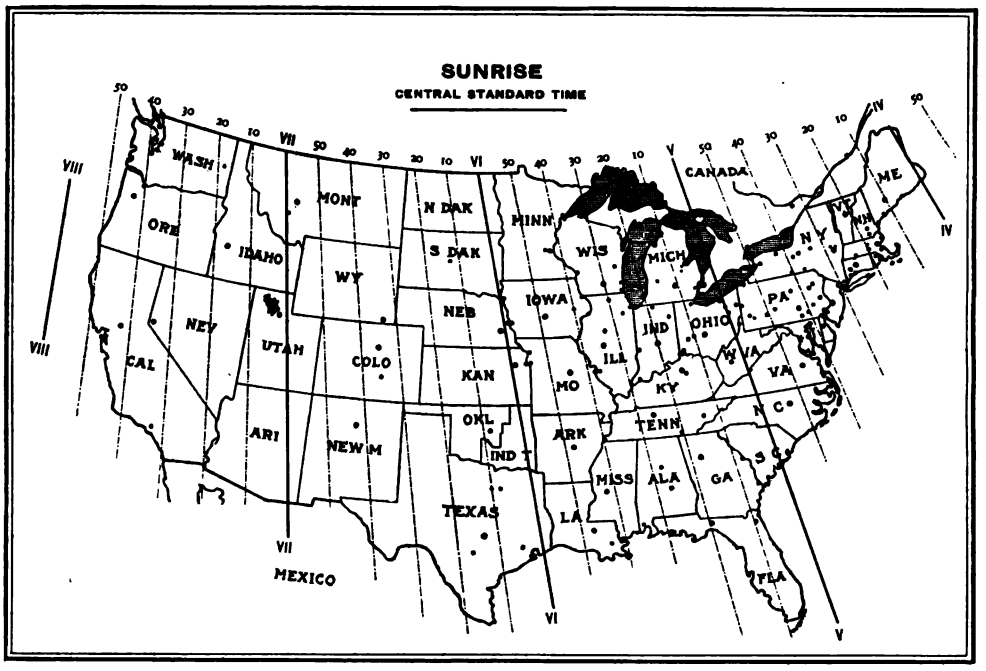

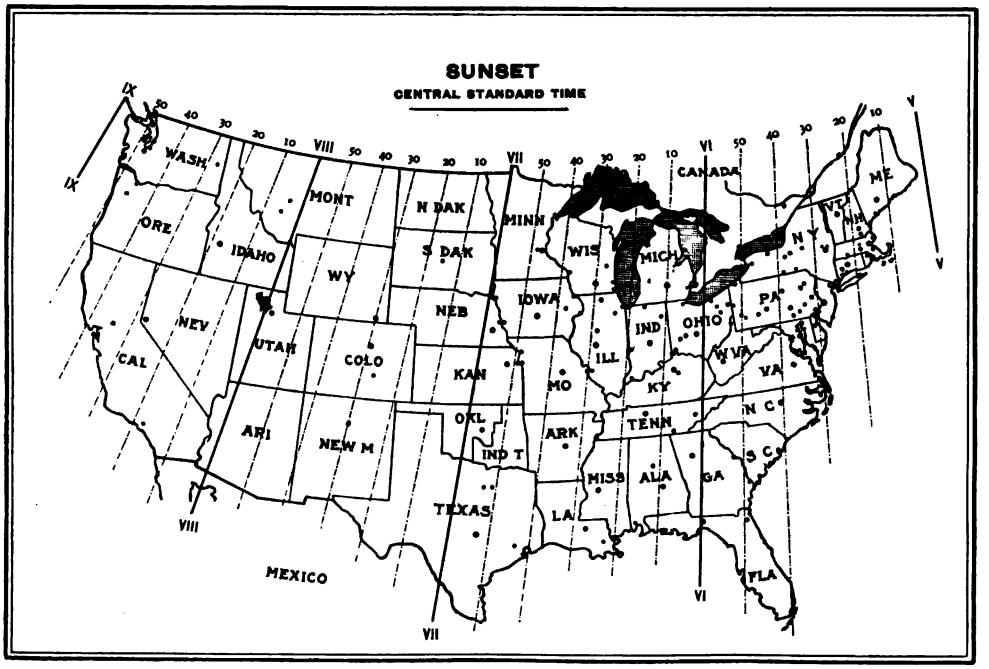

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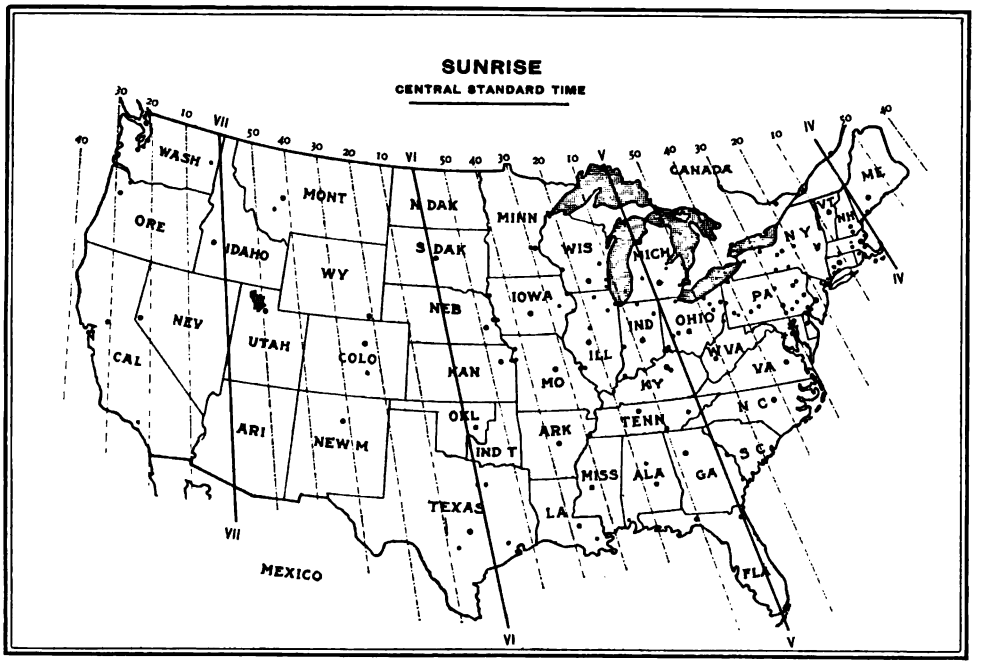

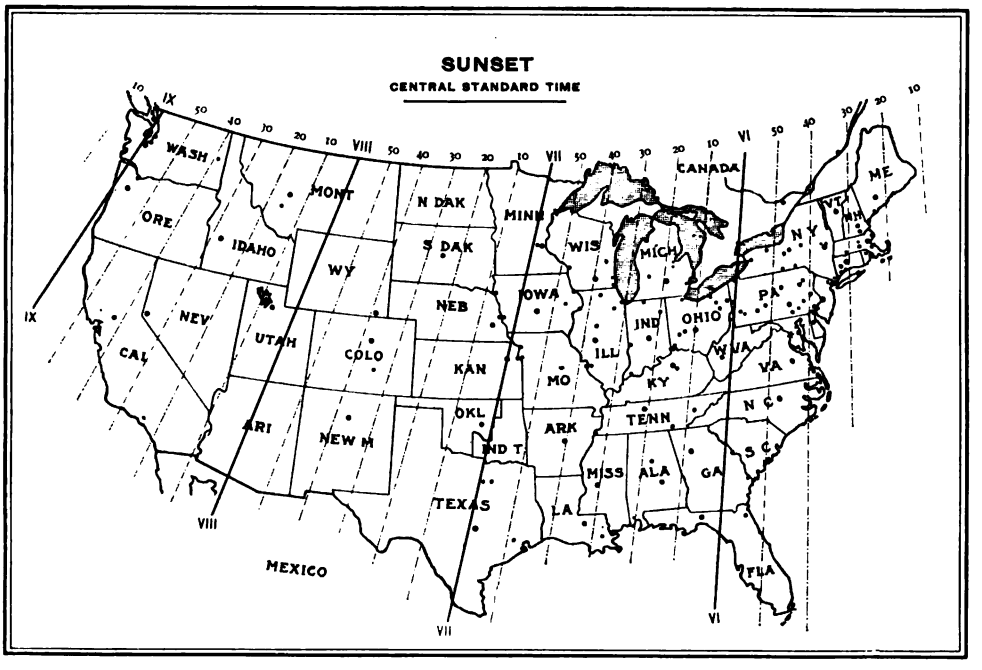

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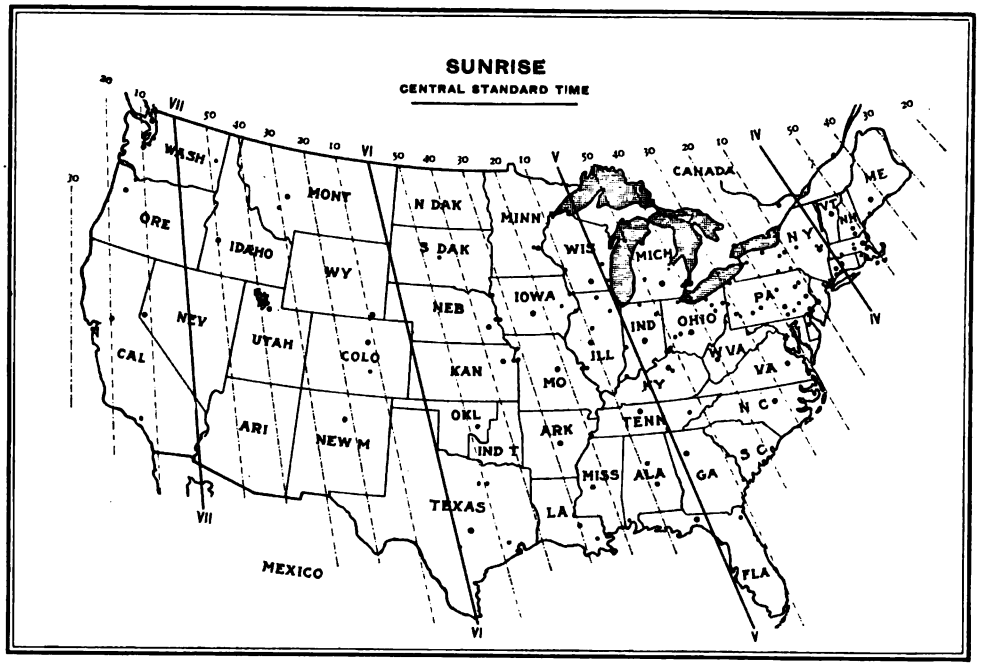

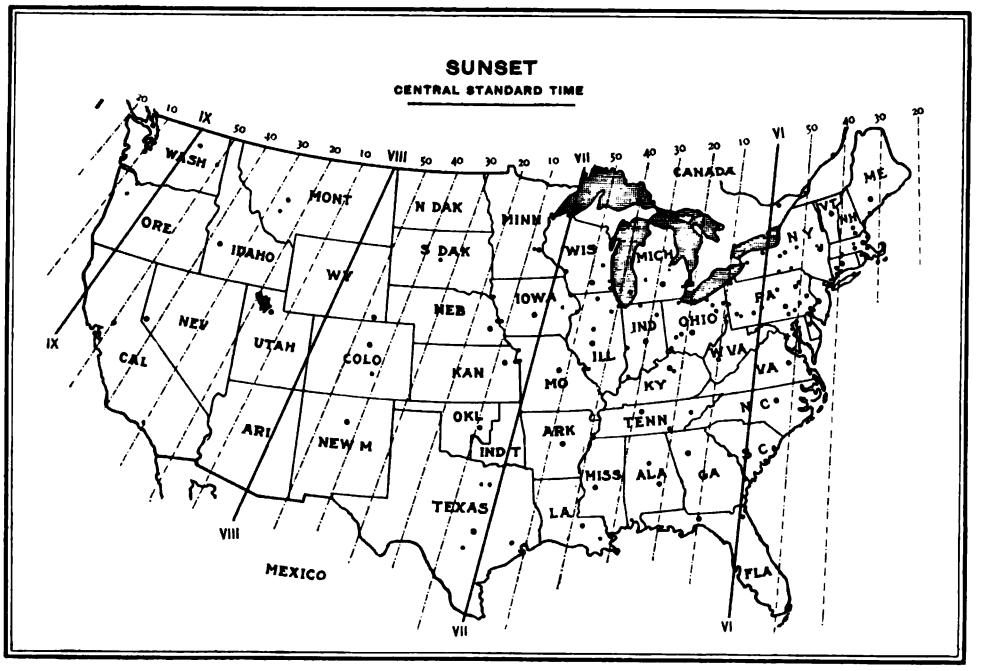

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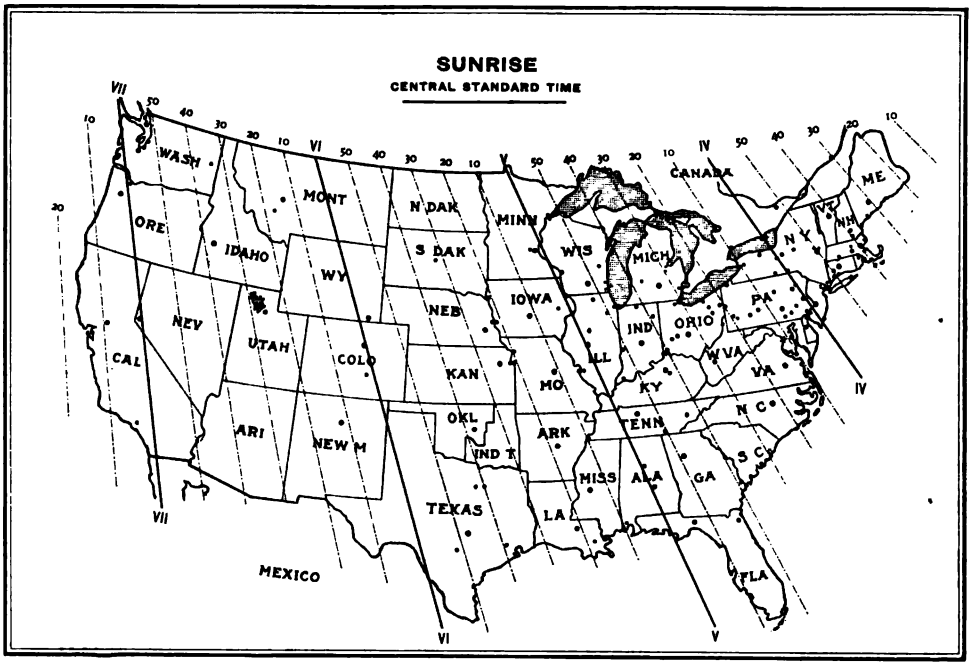
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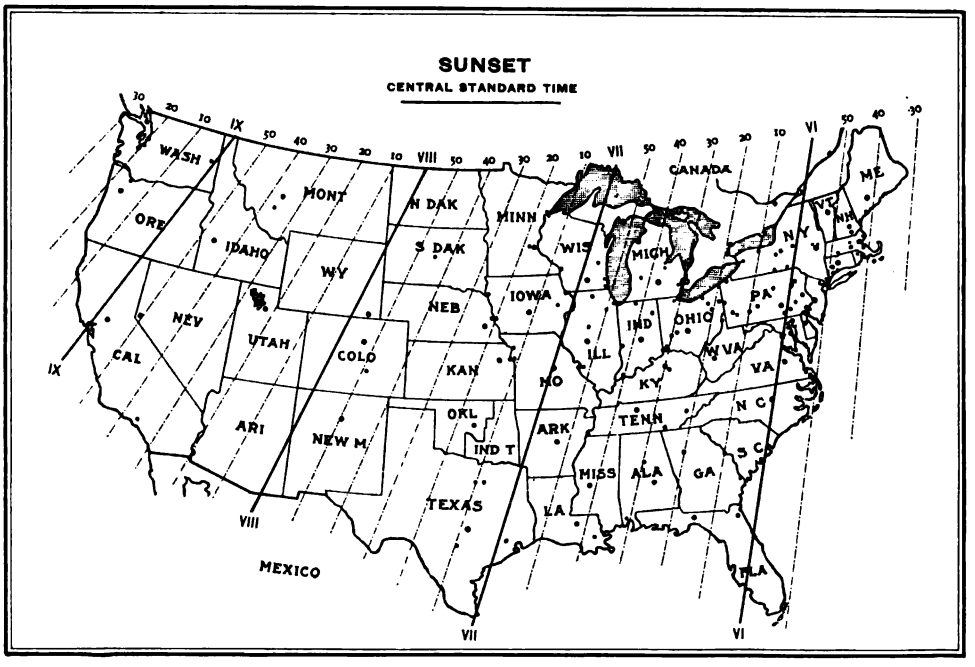
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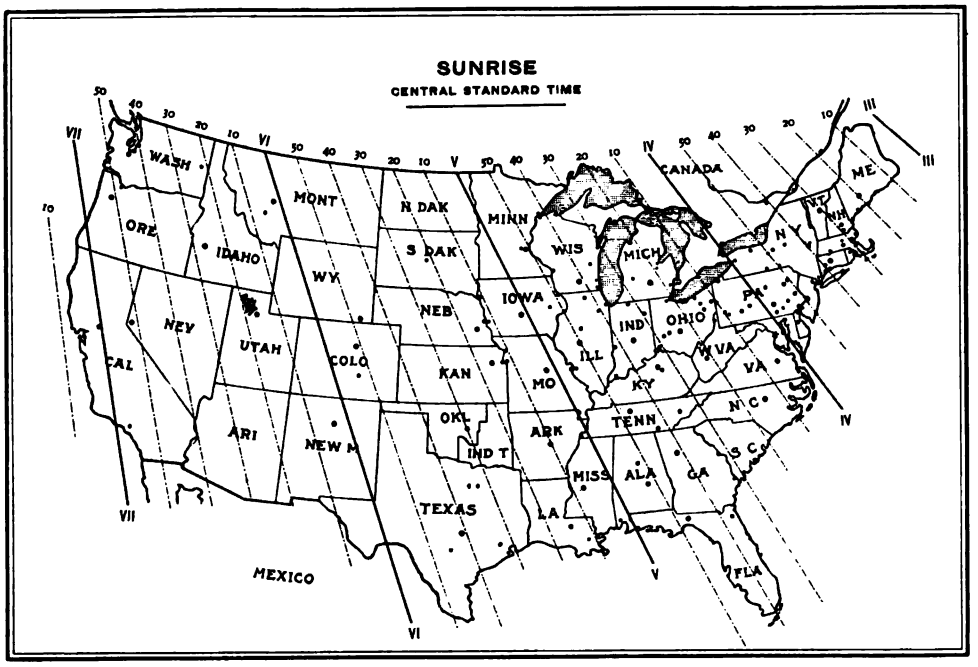
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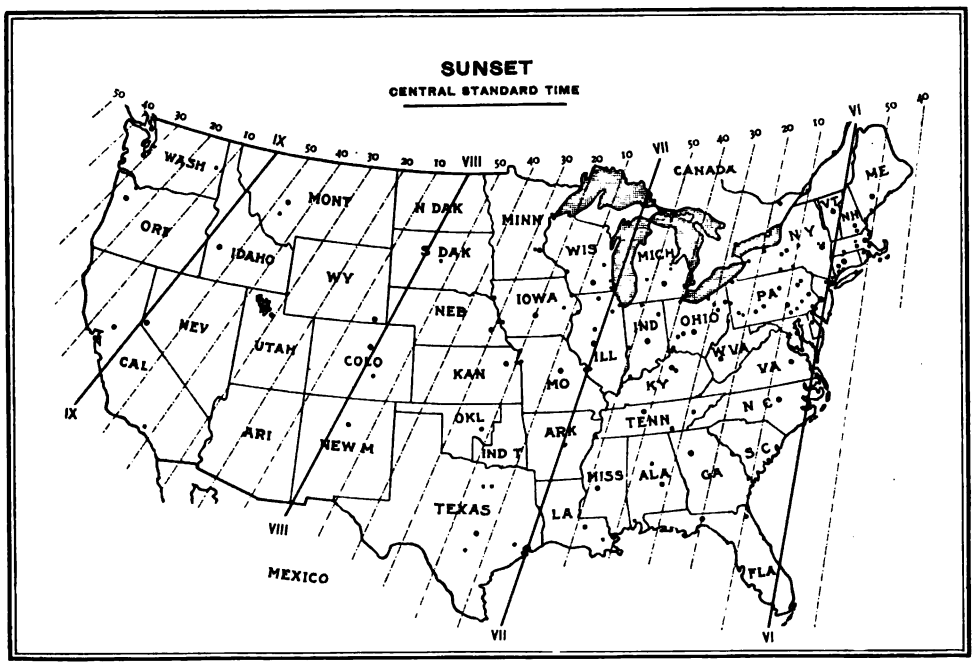
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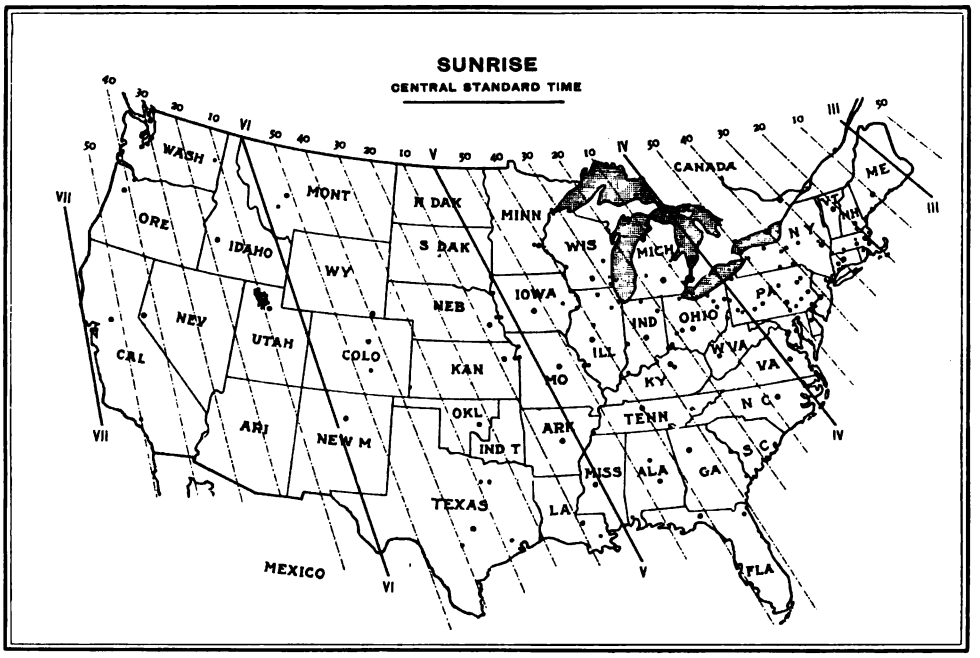
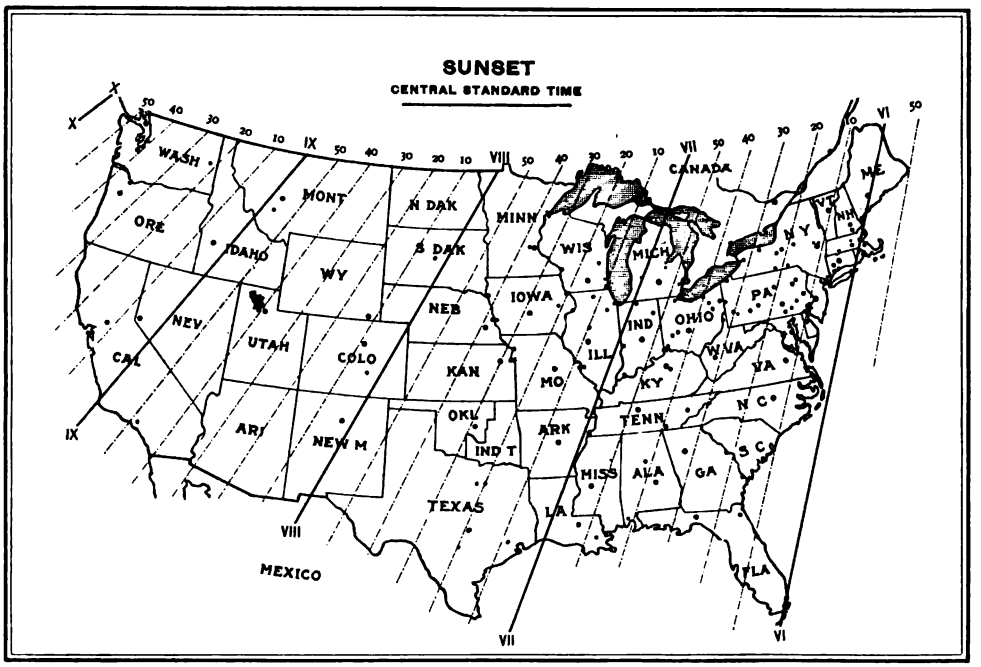
MAY SEVENTEENTH





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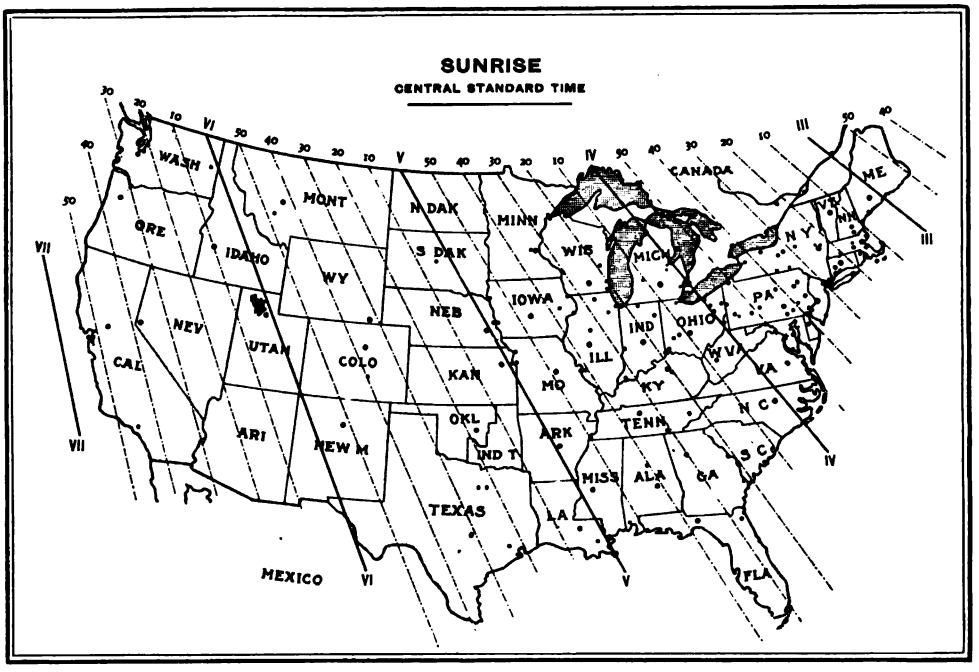

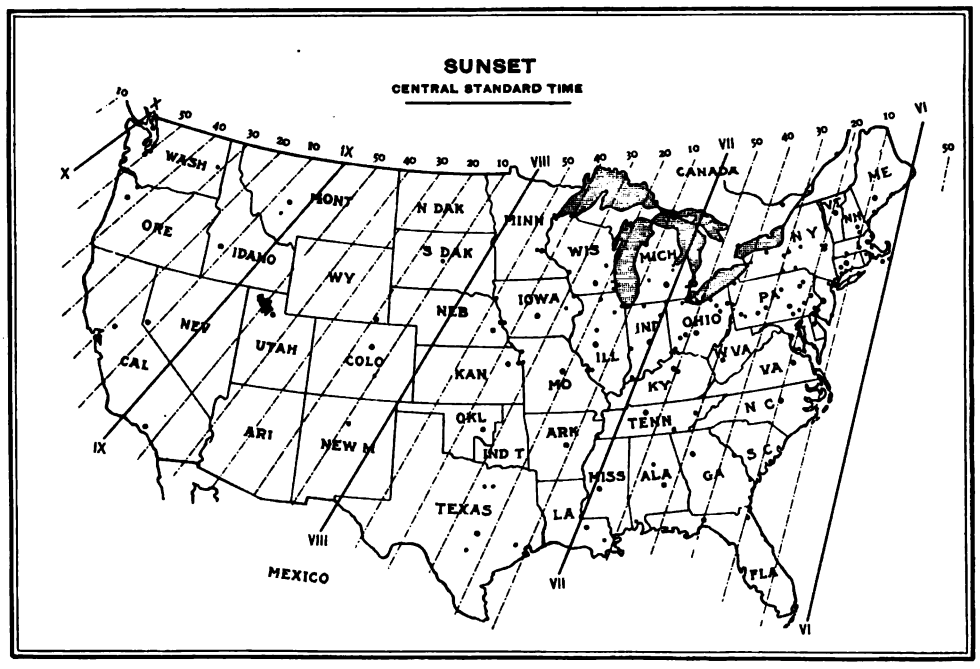

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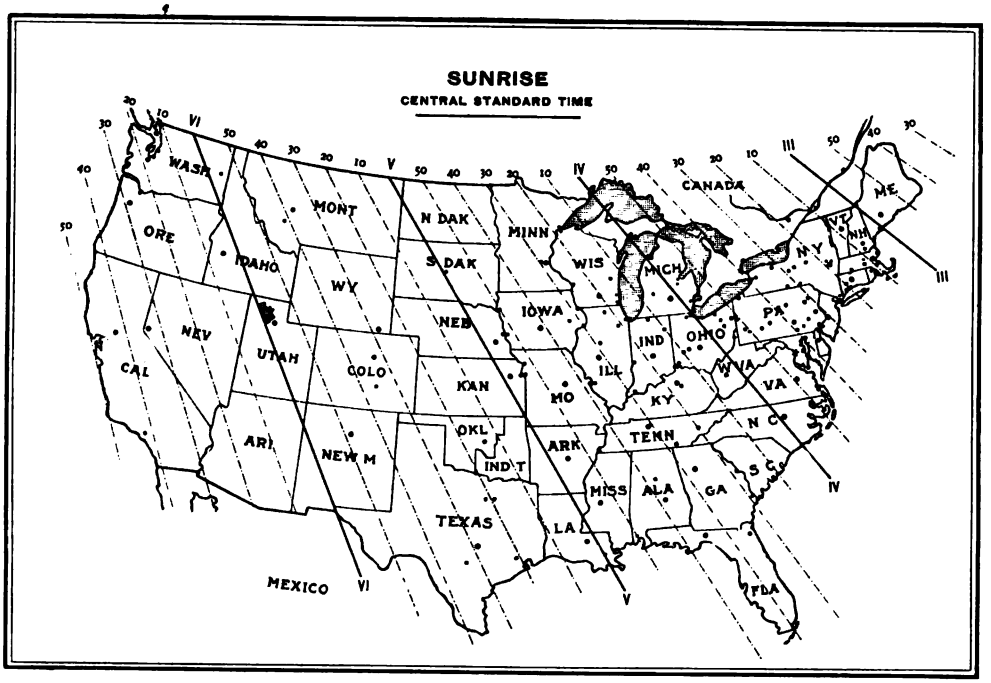
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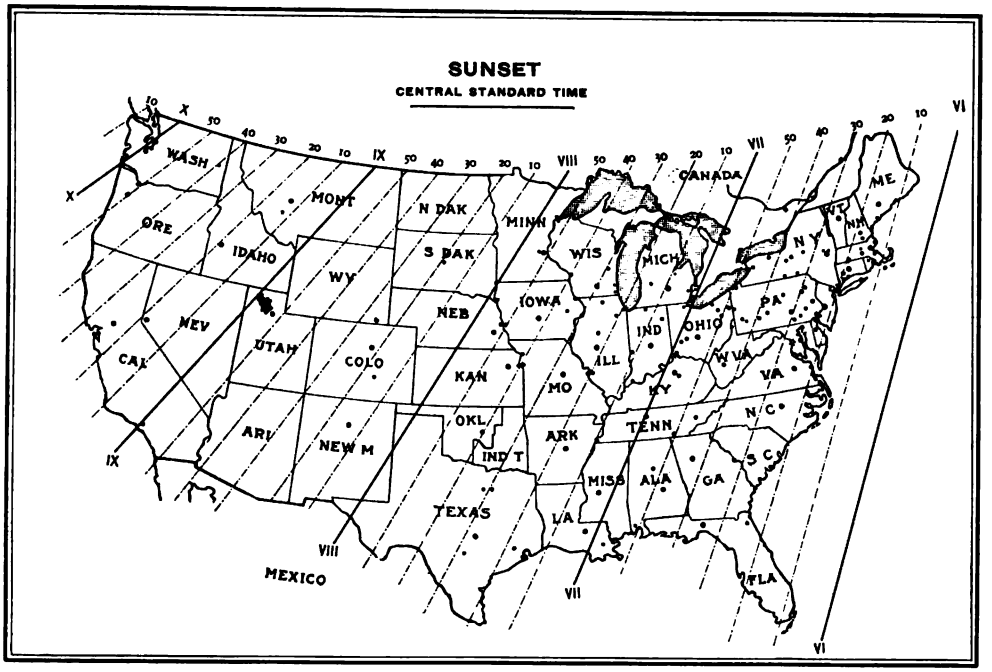
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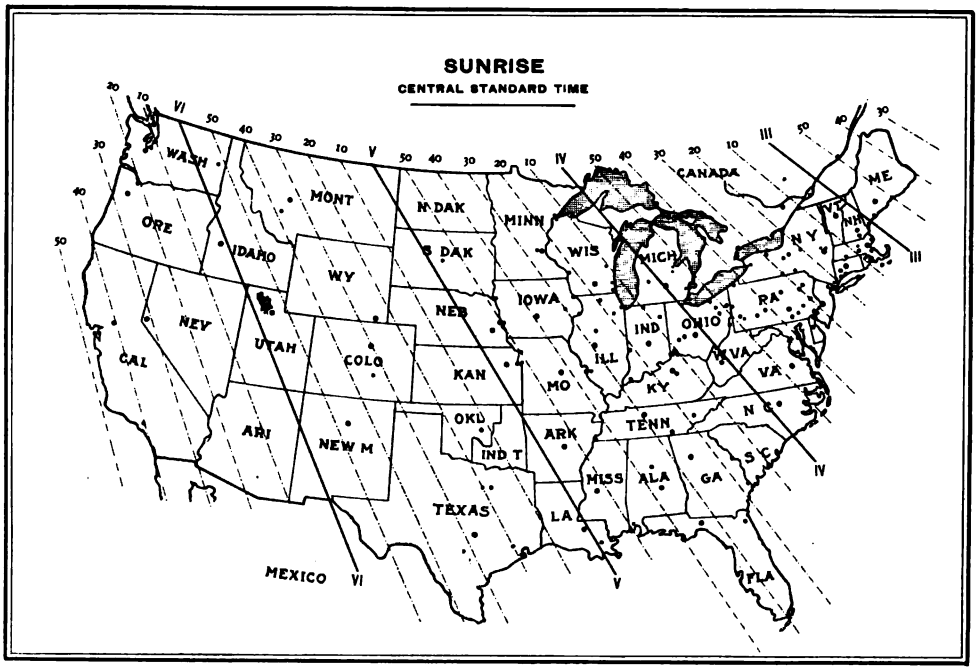
JUNE TENTH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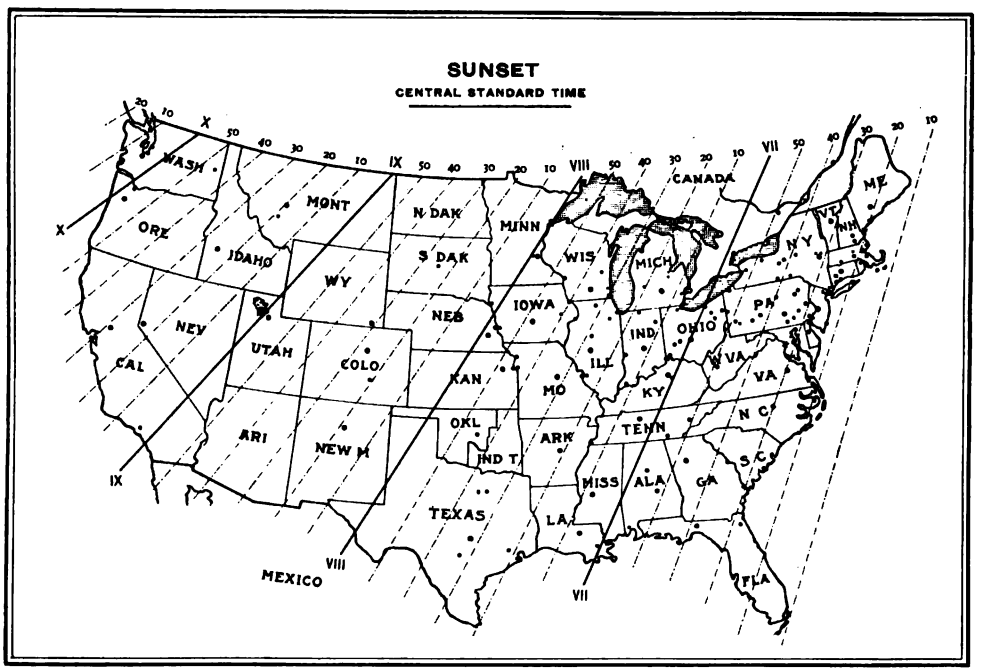
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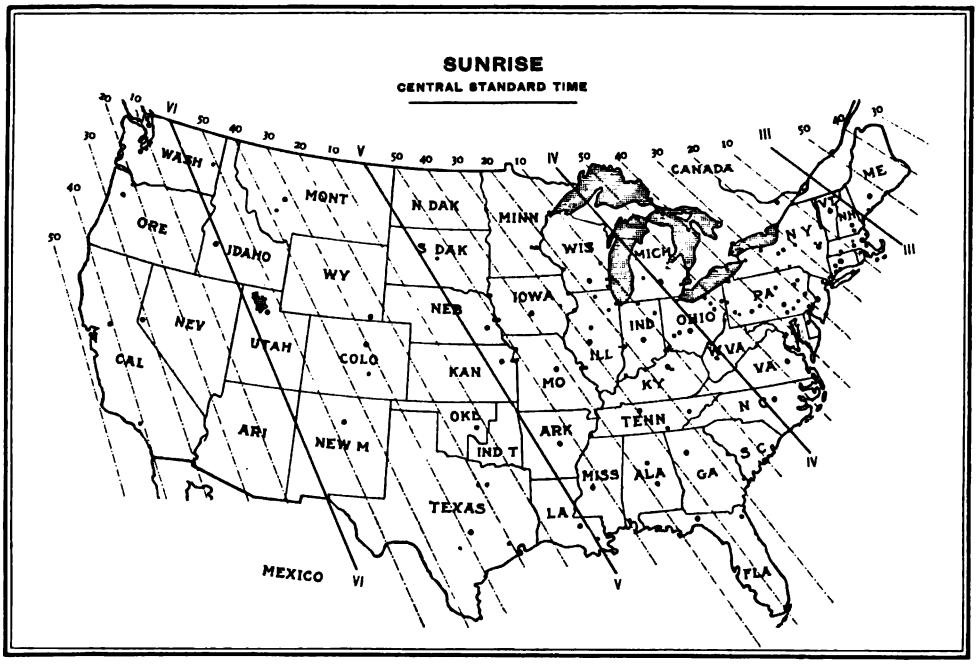
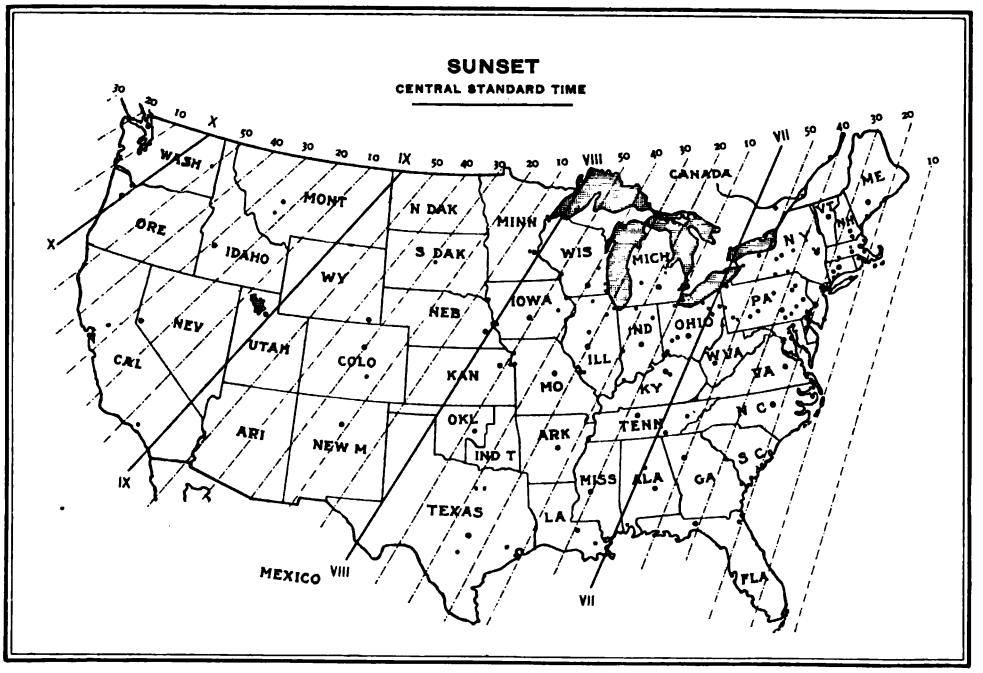
JUNE EIGHTEENTH





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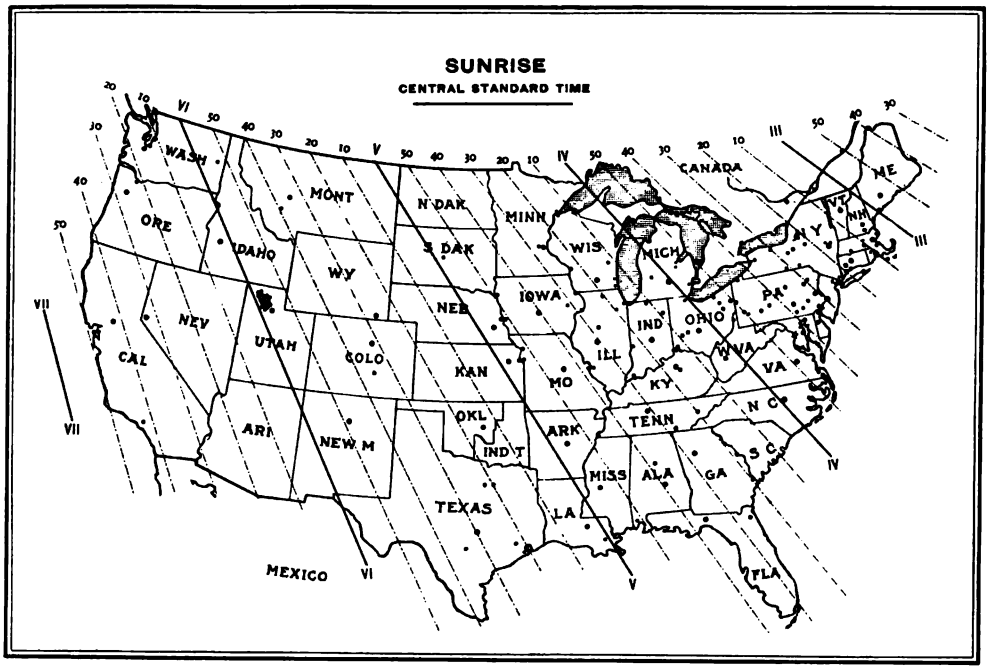

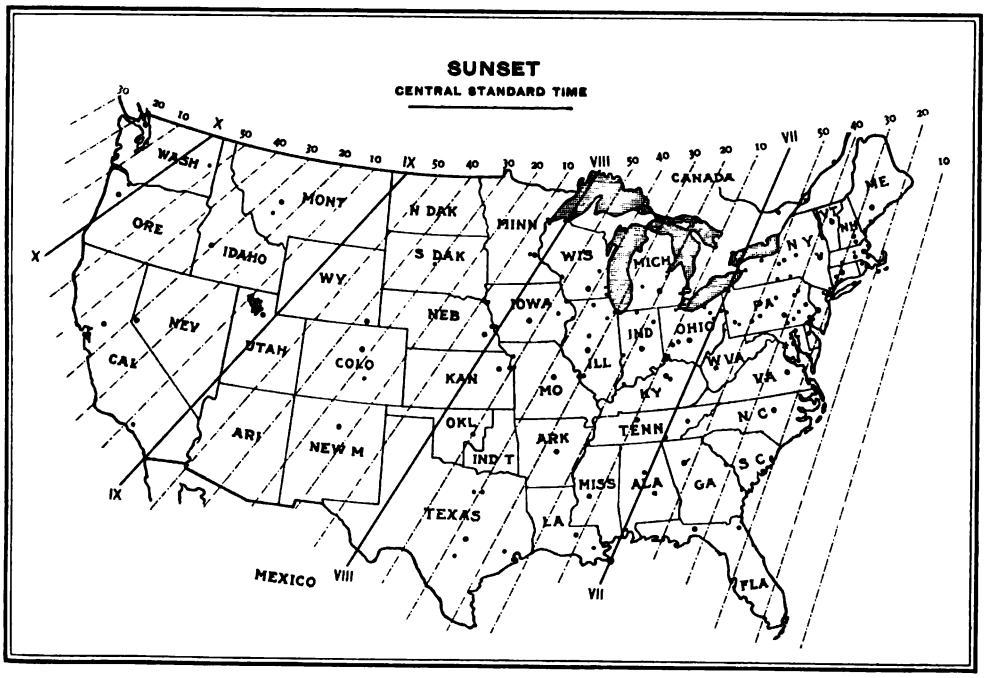

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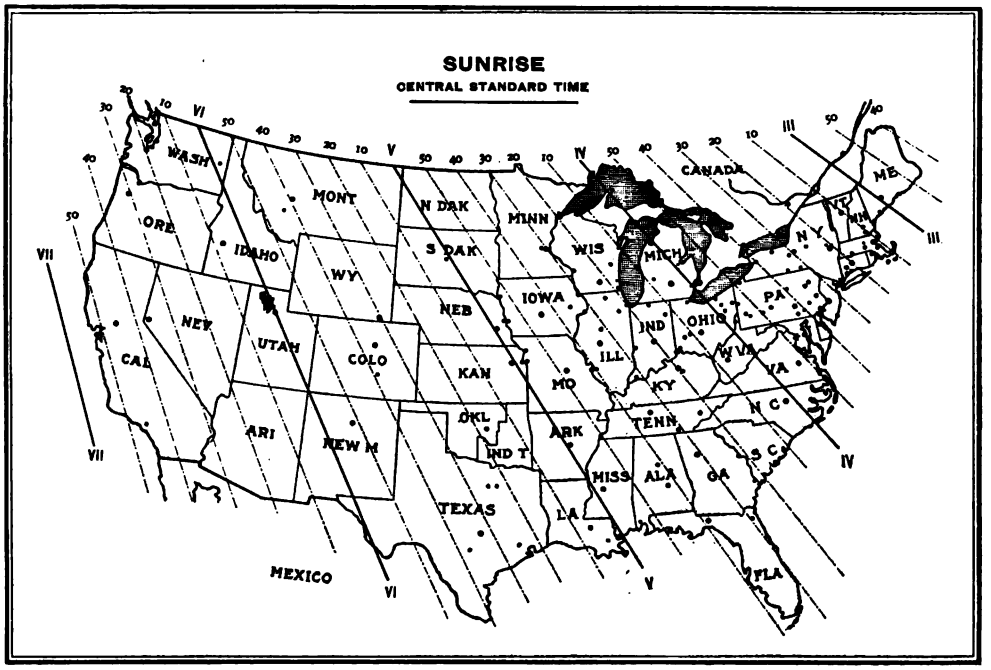
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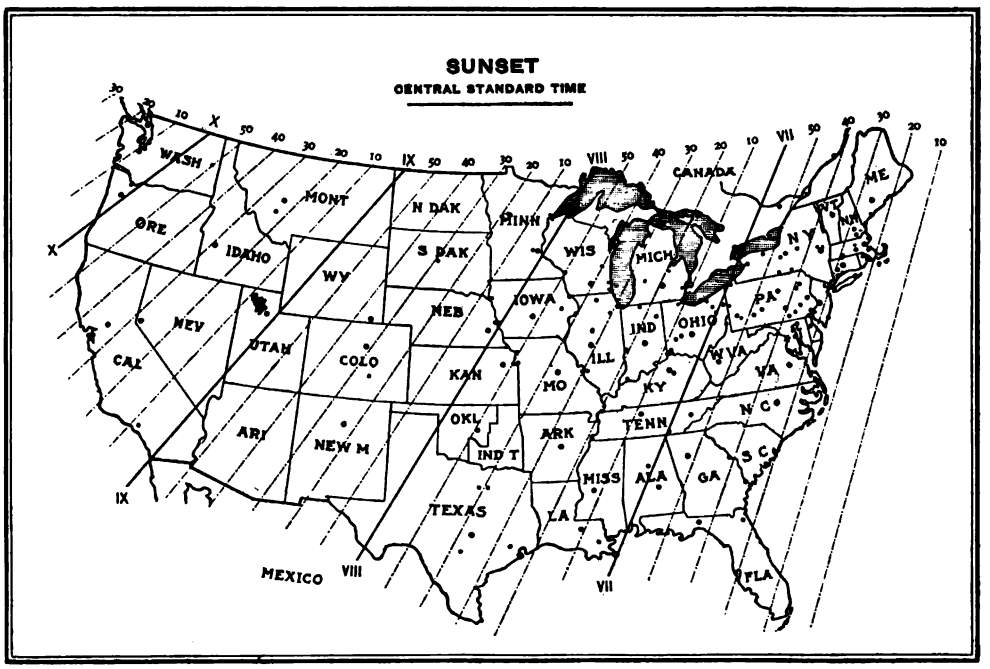
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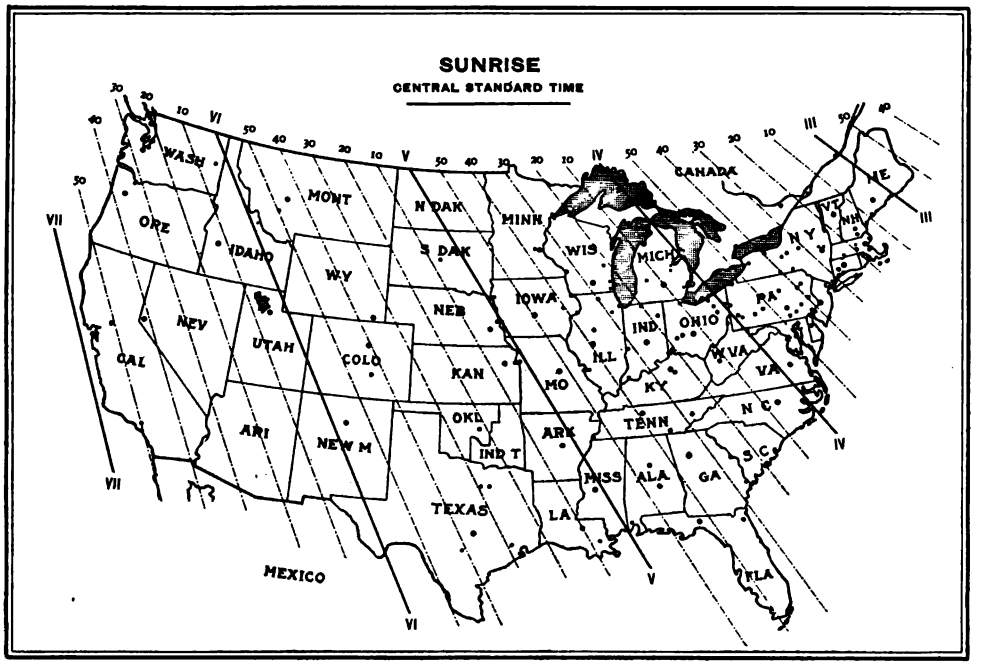
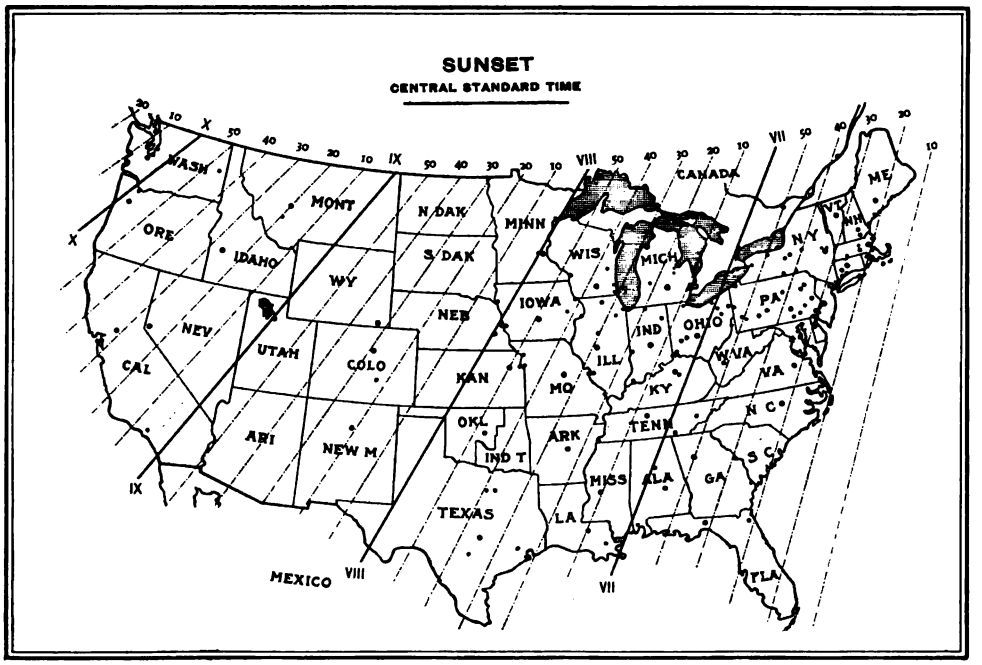
JULY TWELFTH





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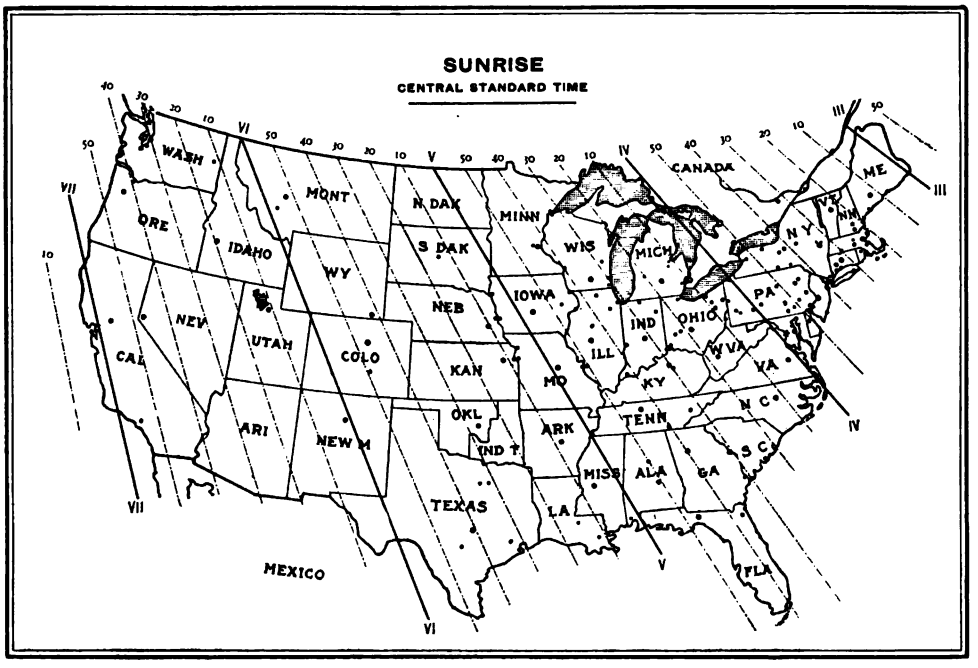

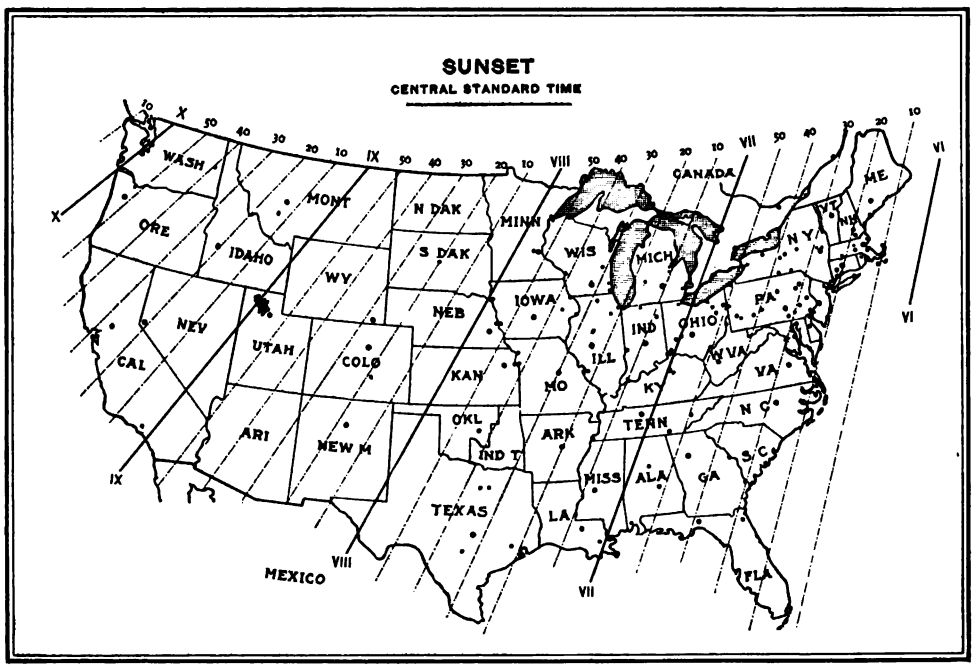

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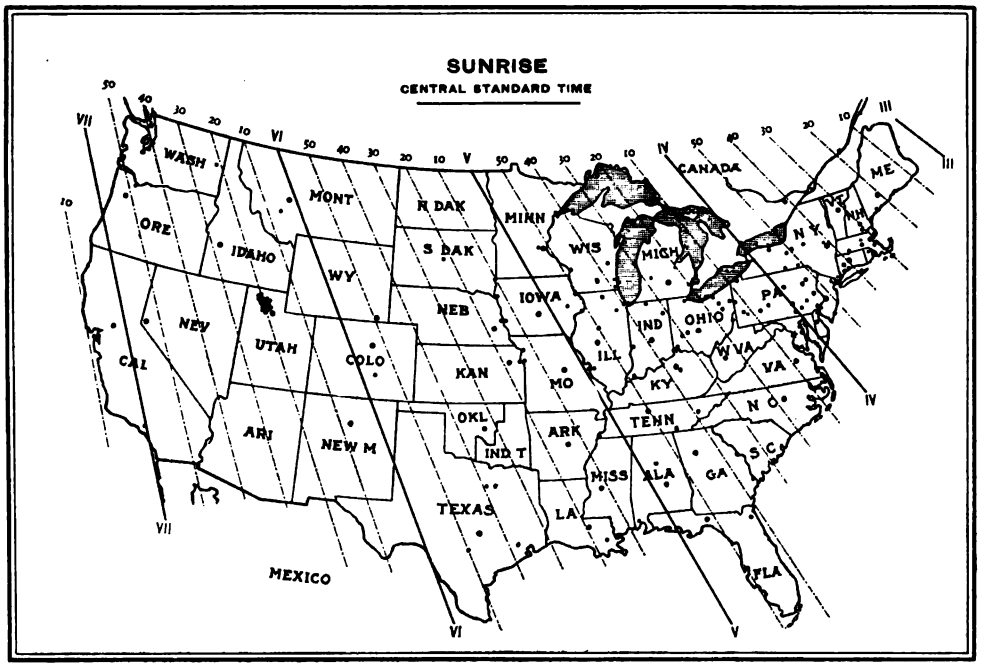

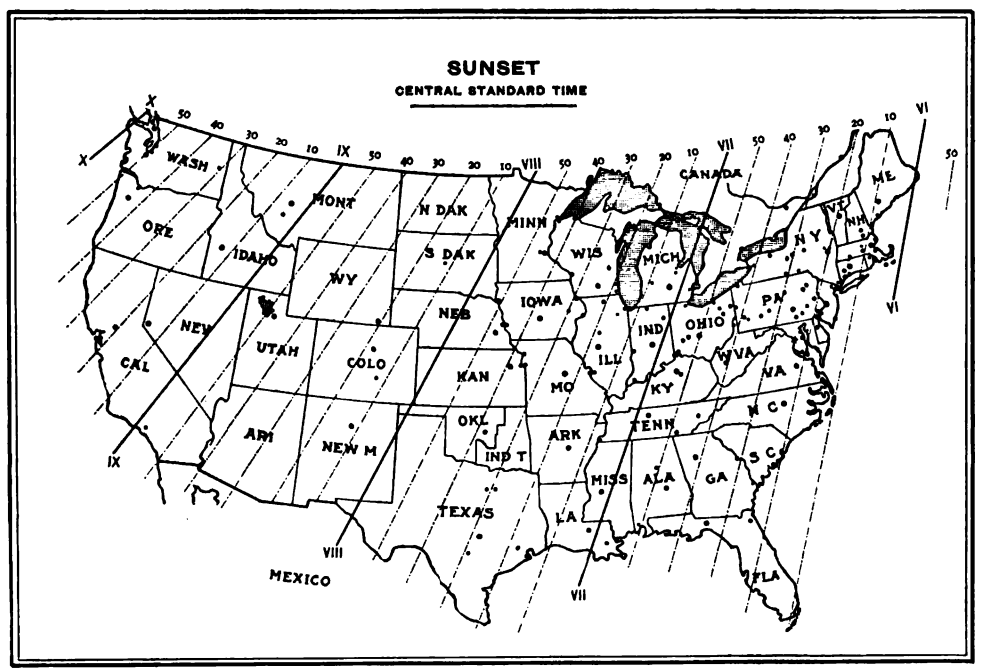

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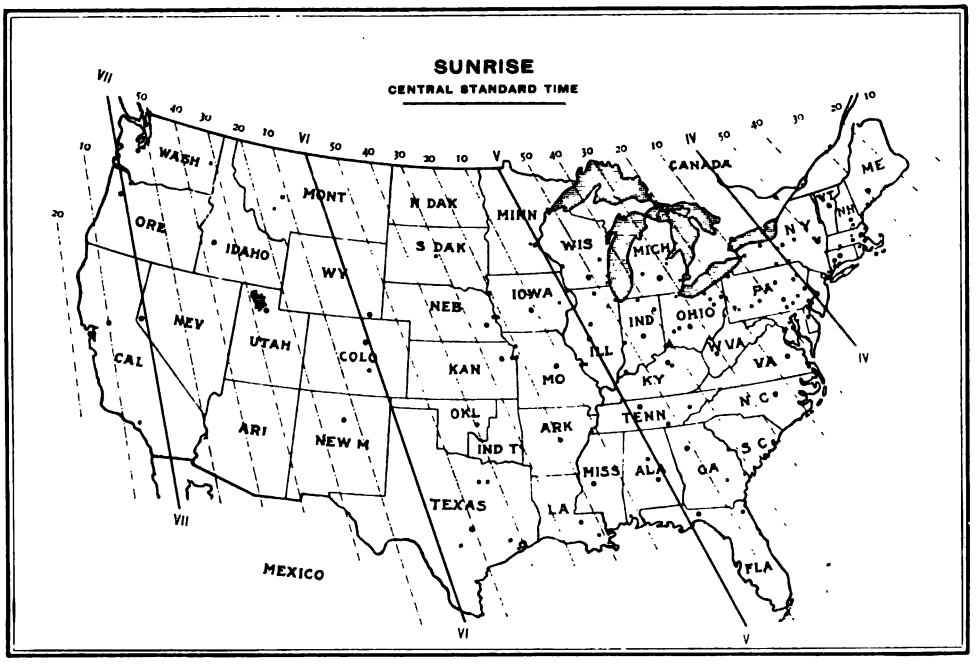

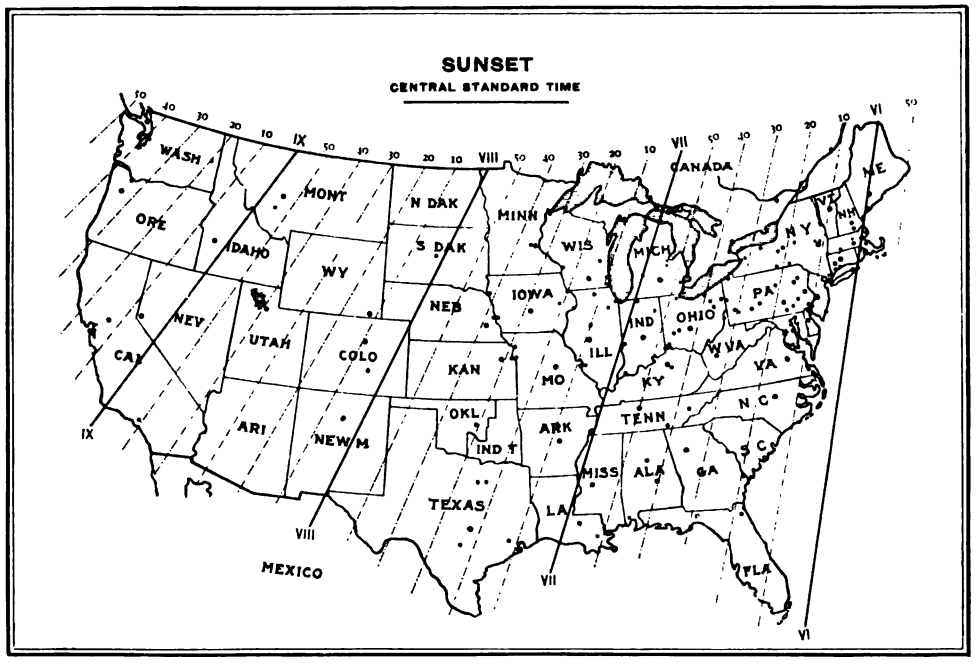

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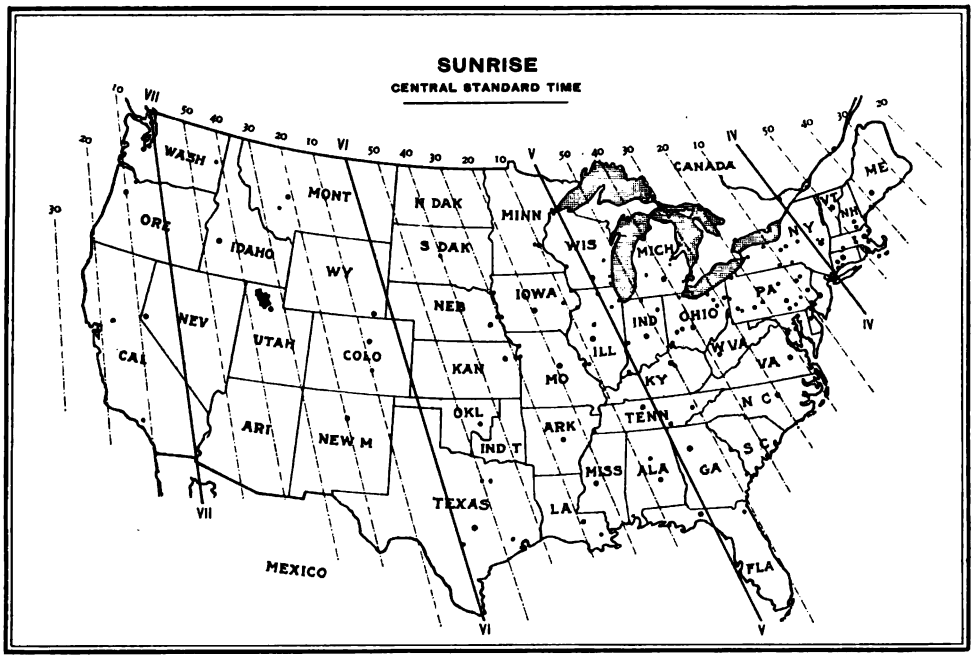

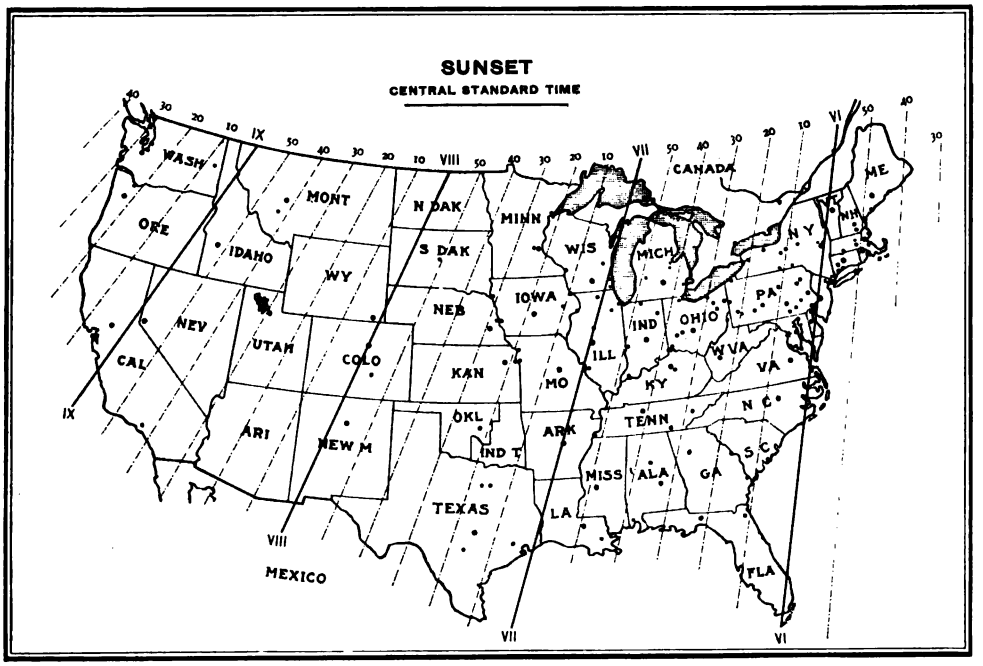

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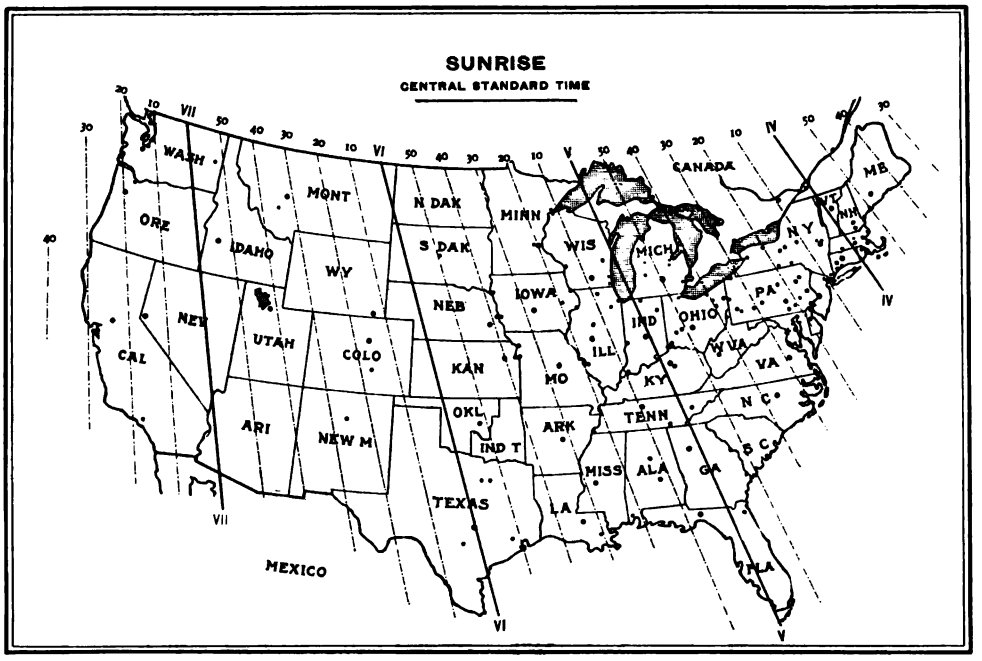

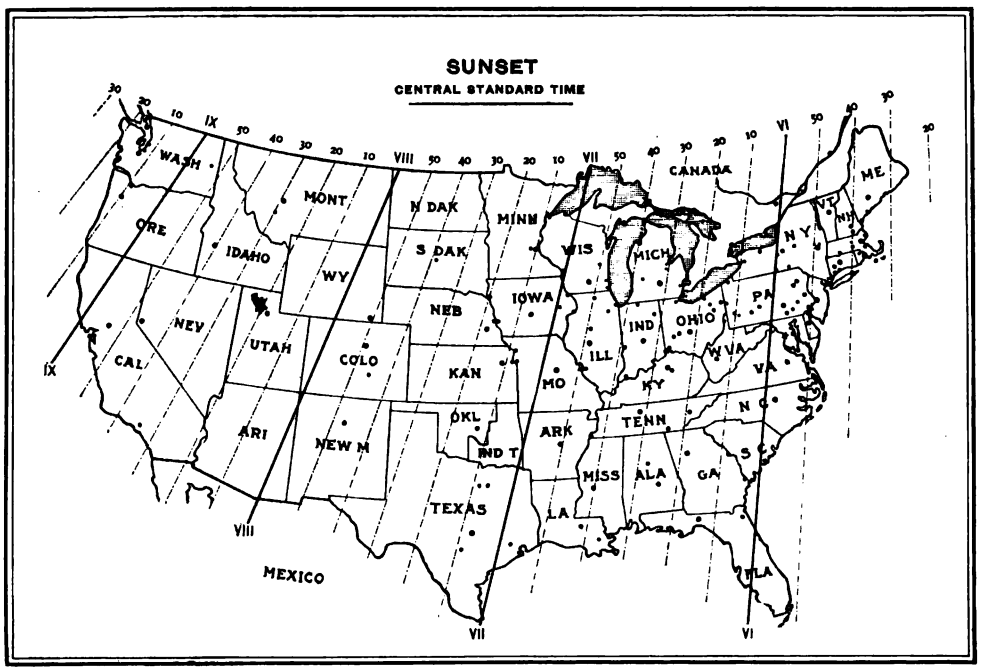

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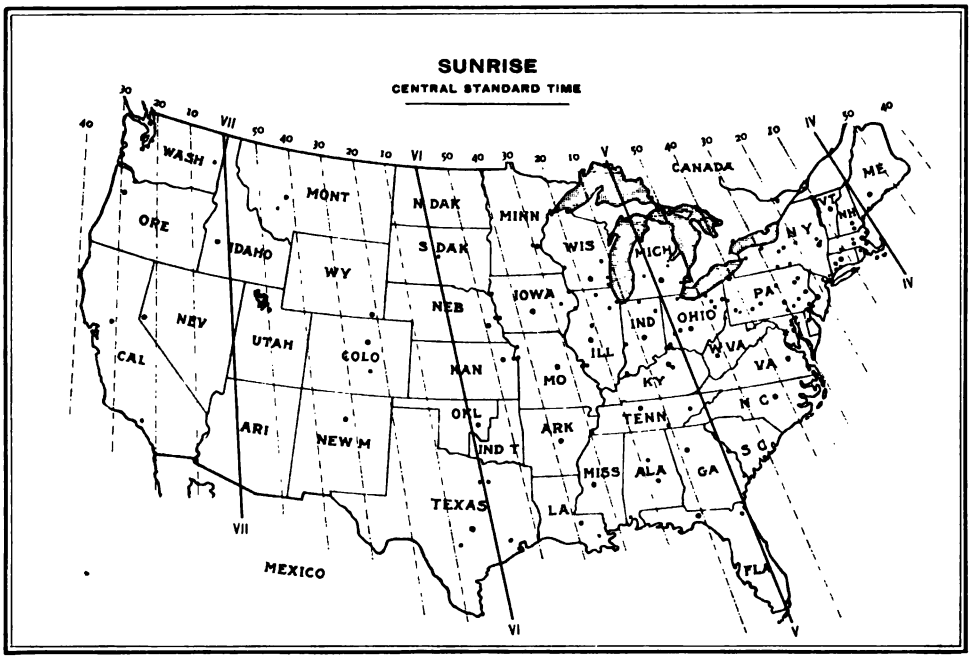
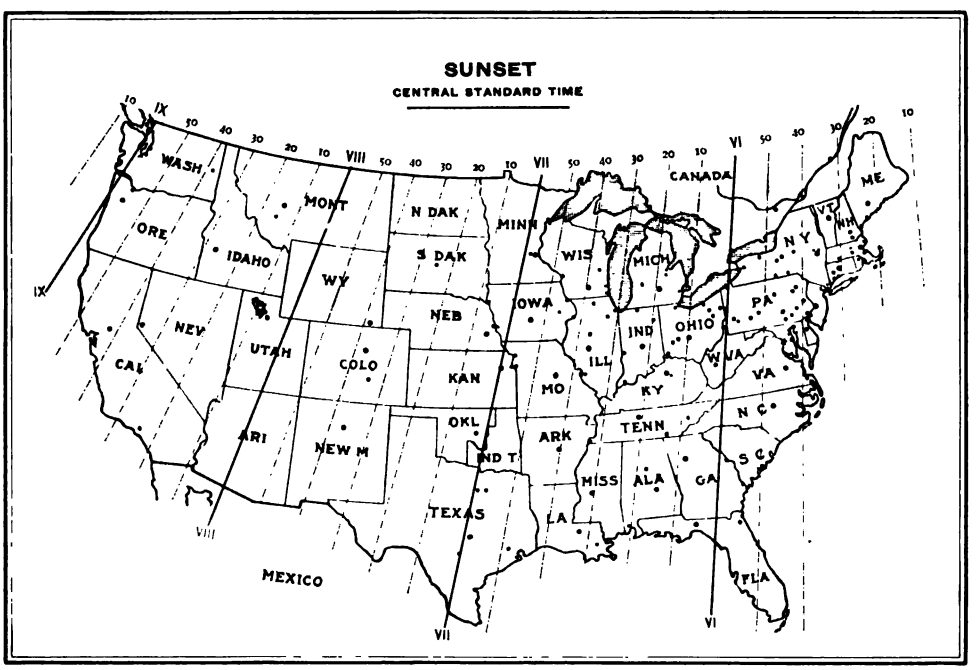
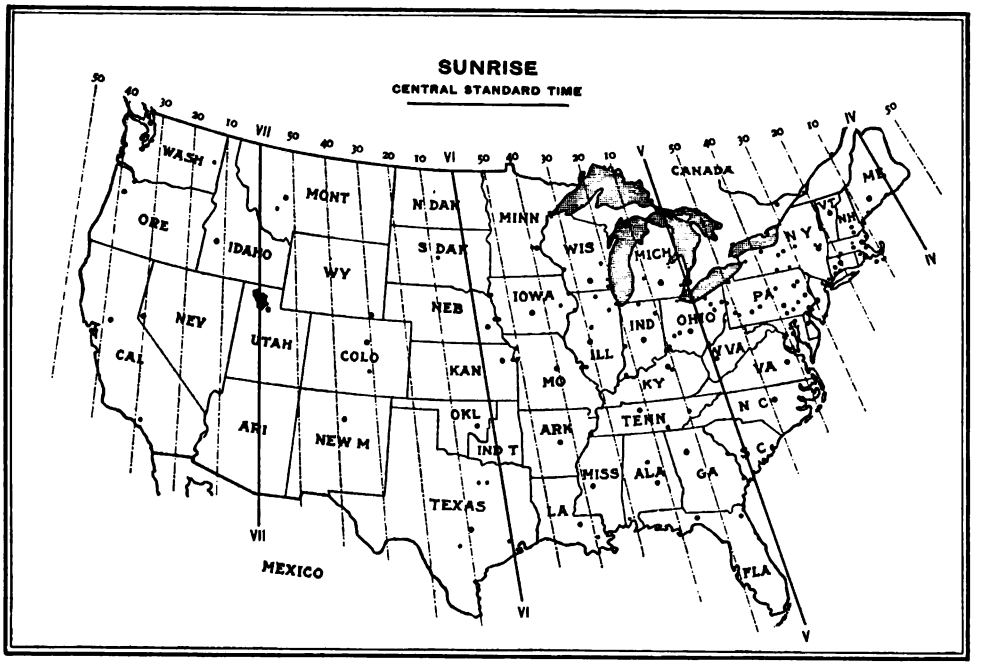
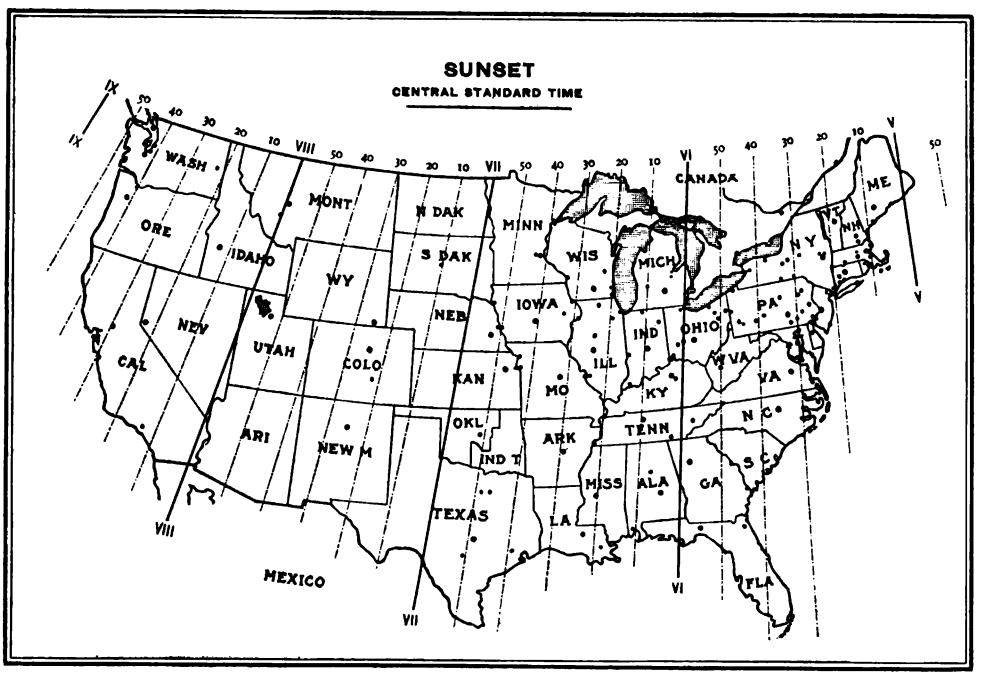




SEPTEMBER SIXTH





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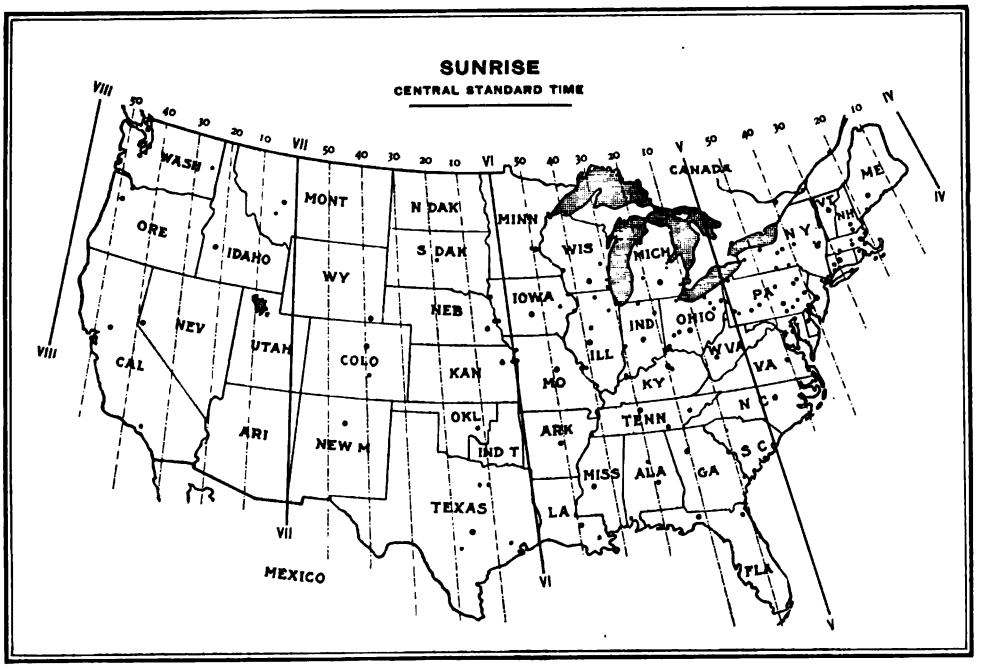

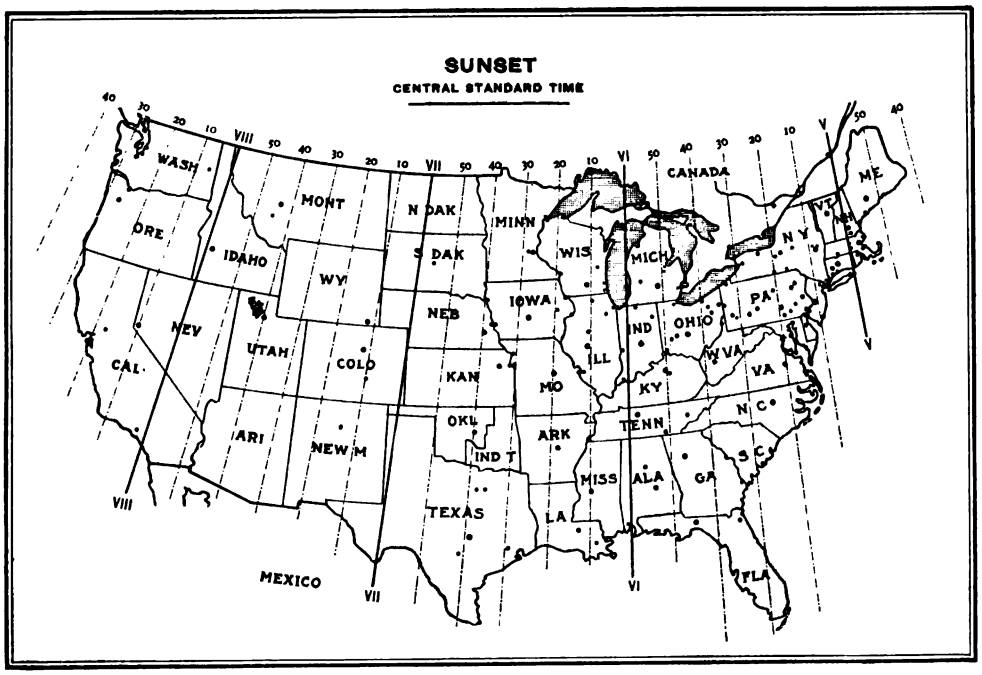

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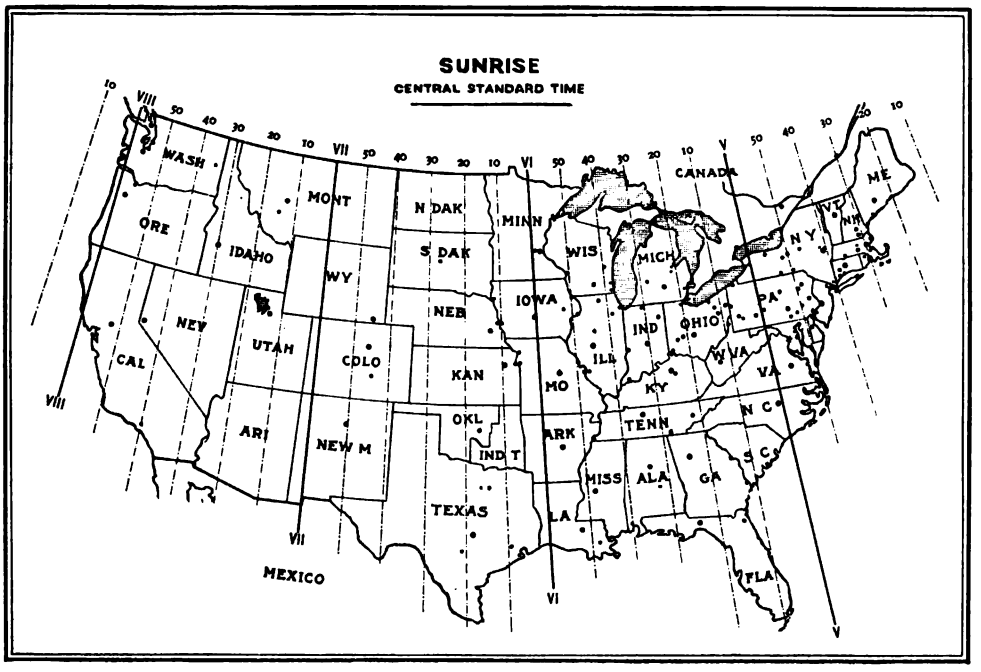

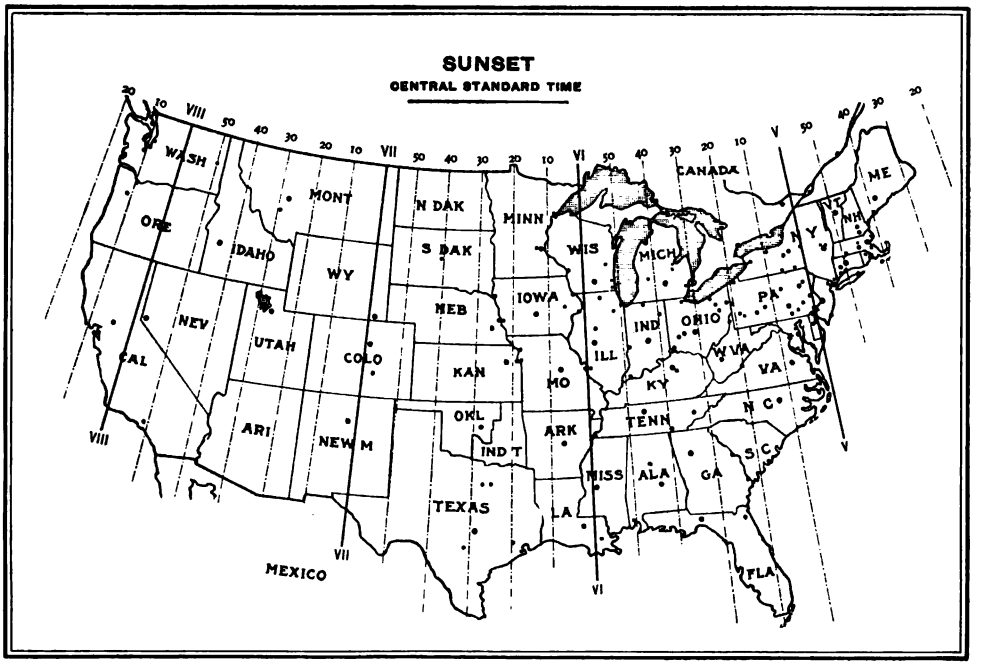

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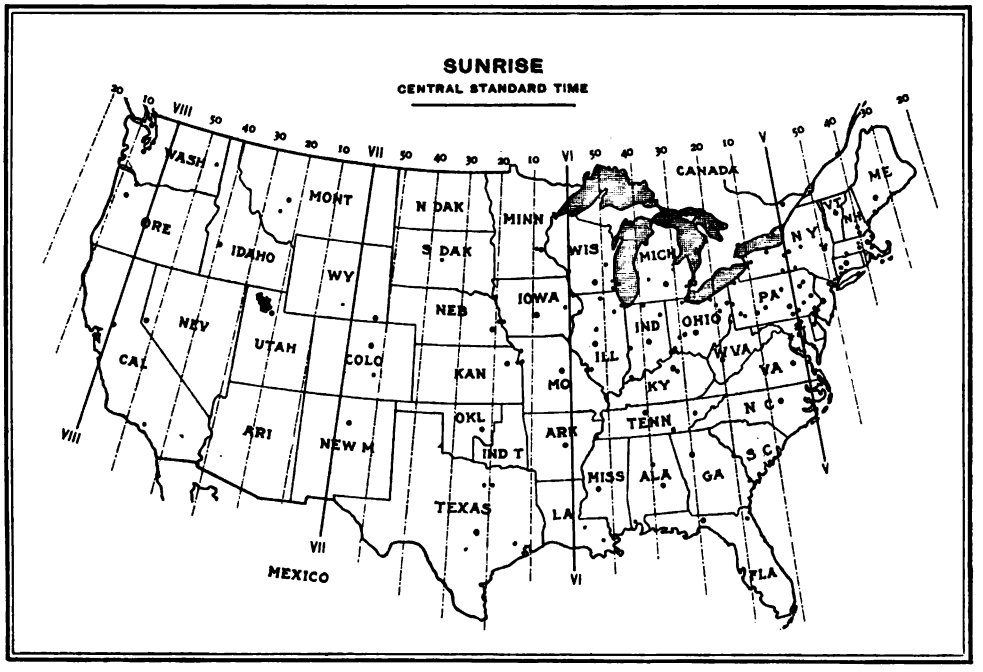
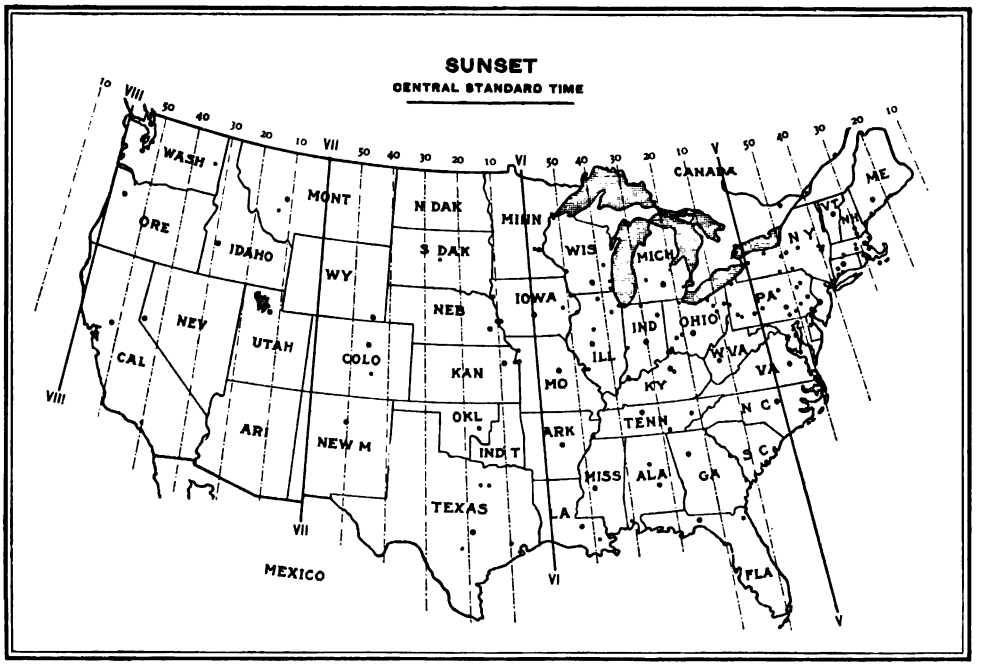
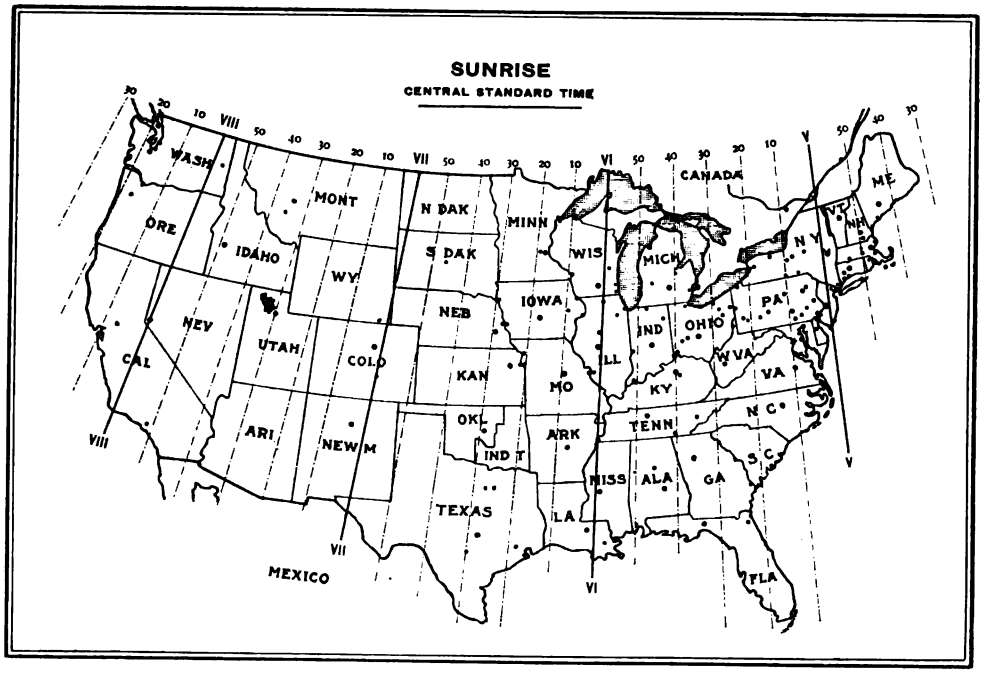
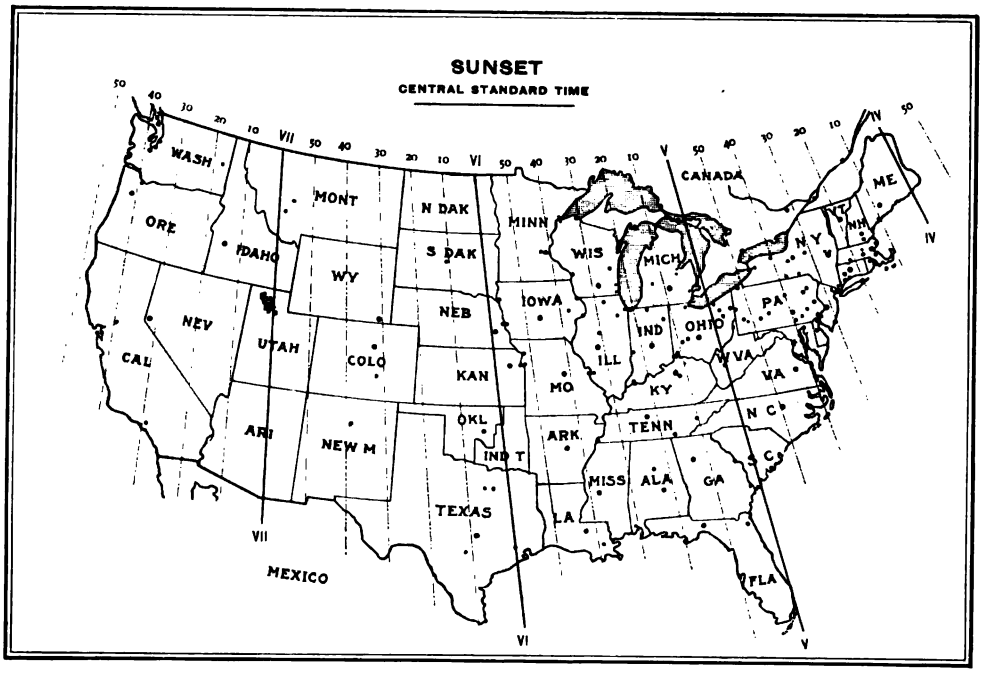




October Eighth





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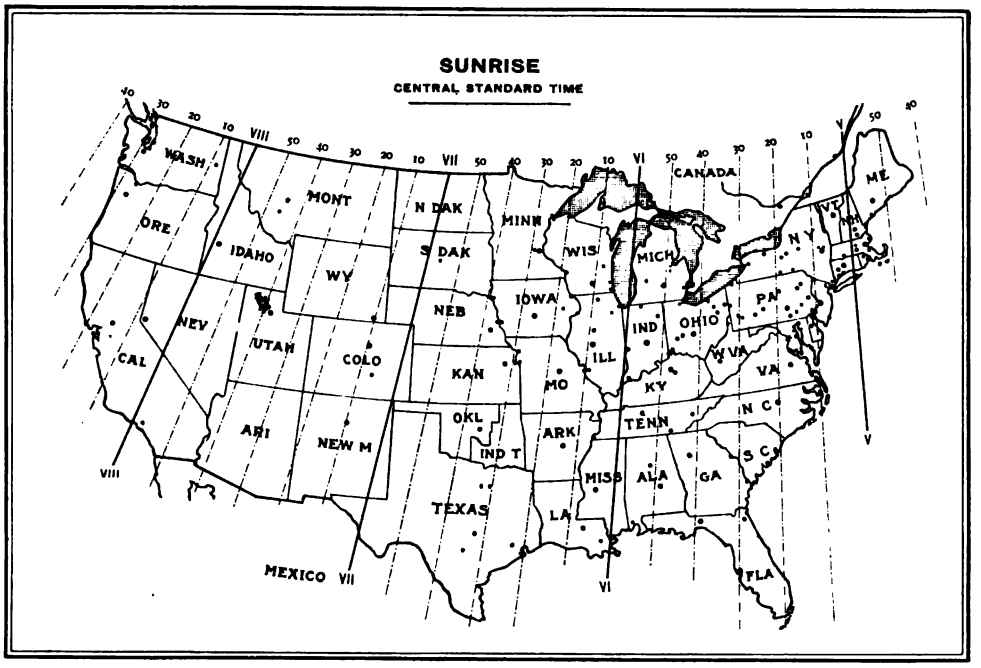

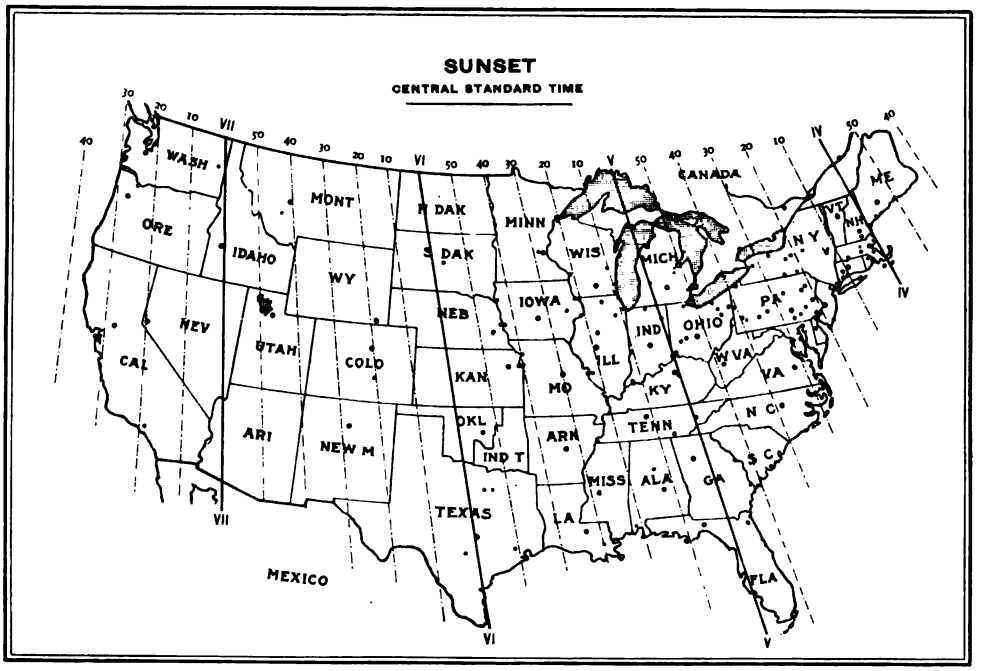

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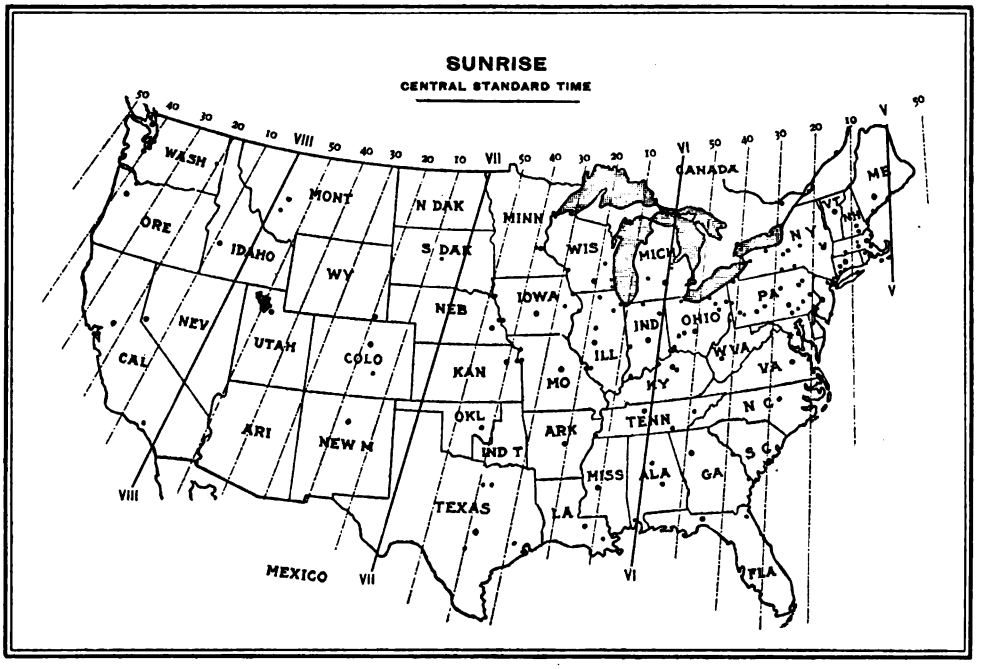
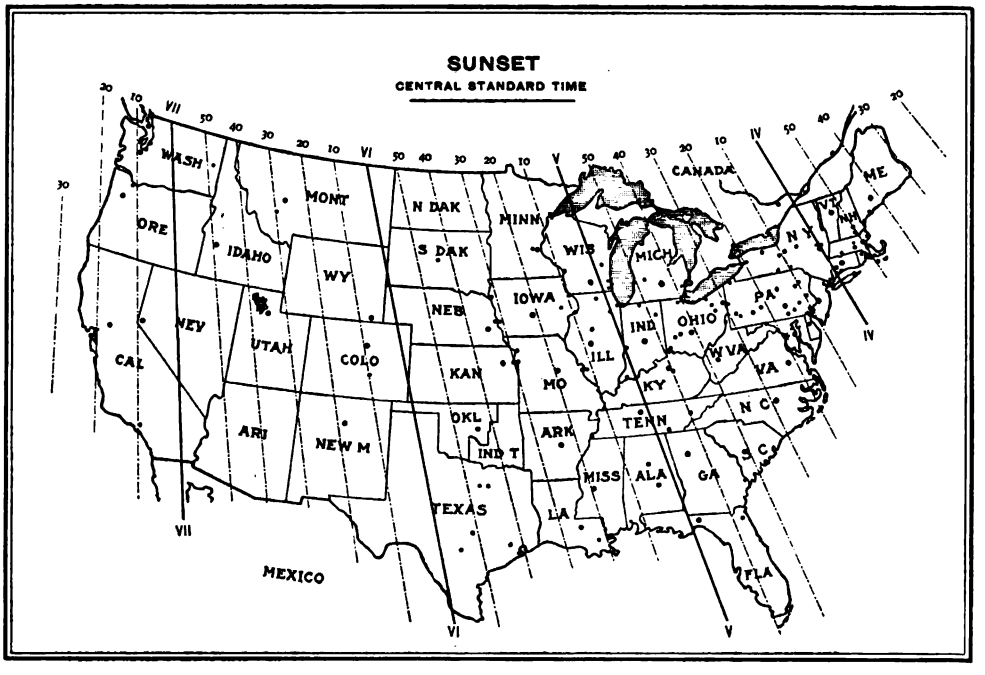
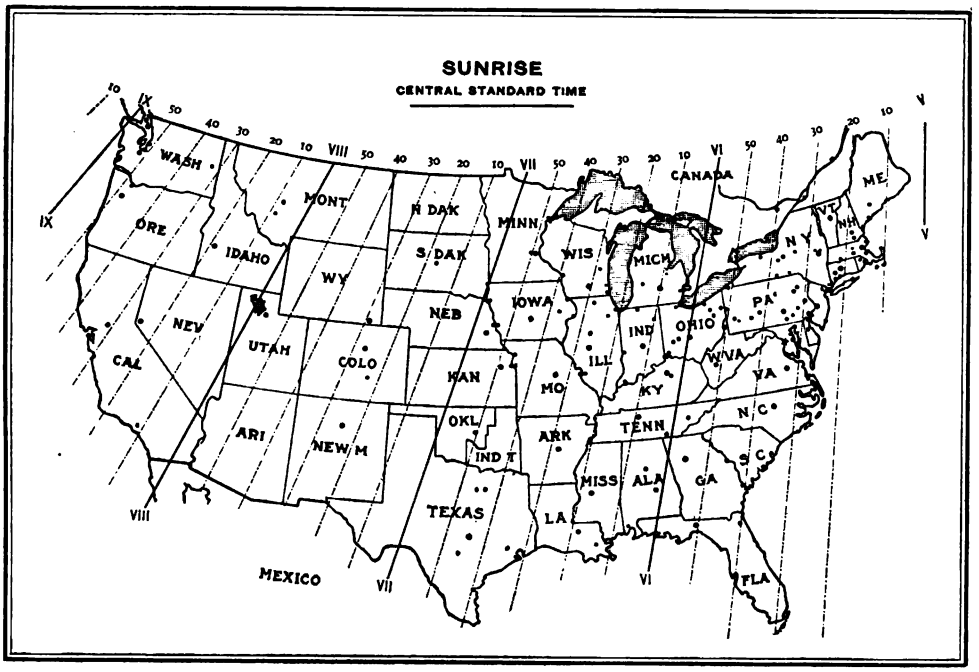
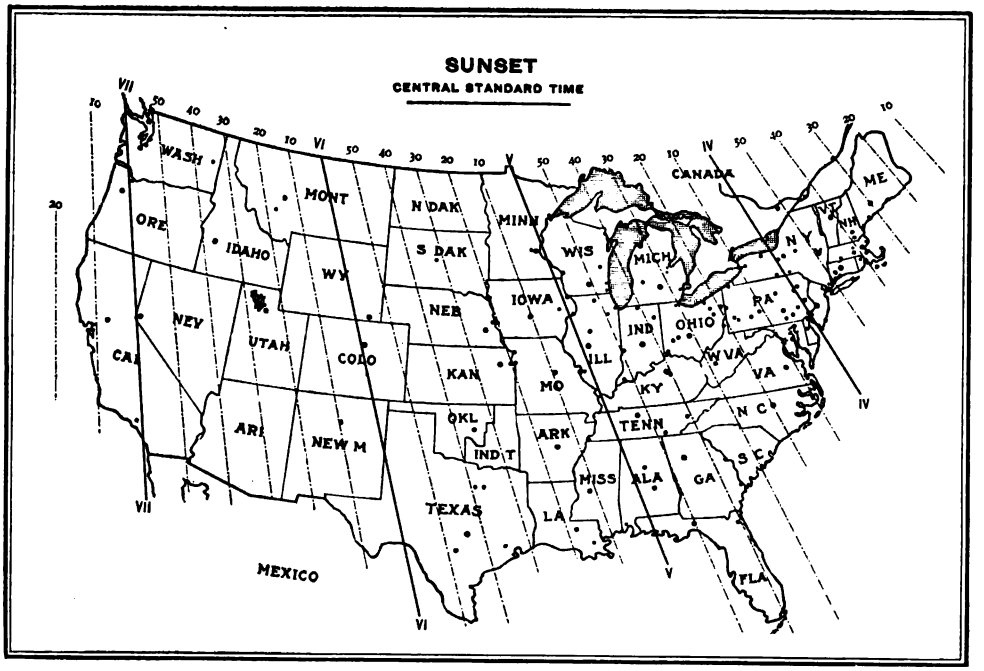


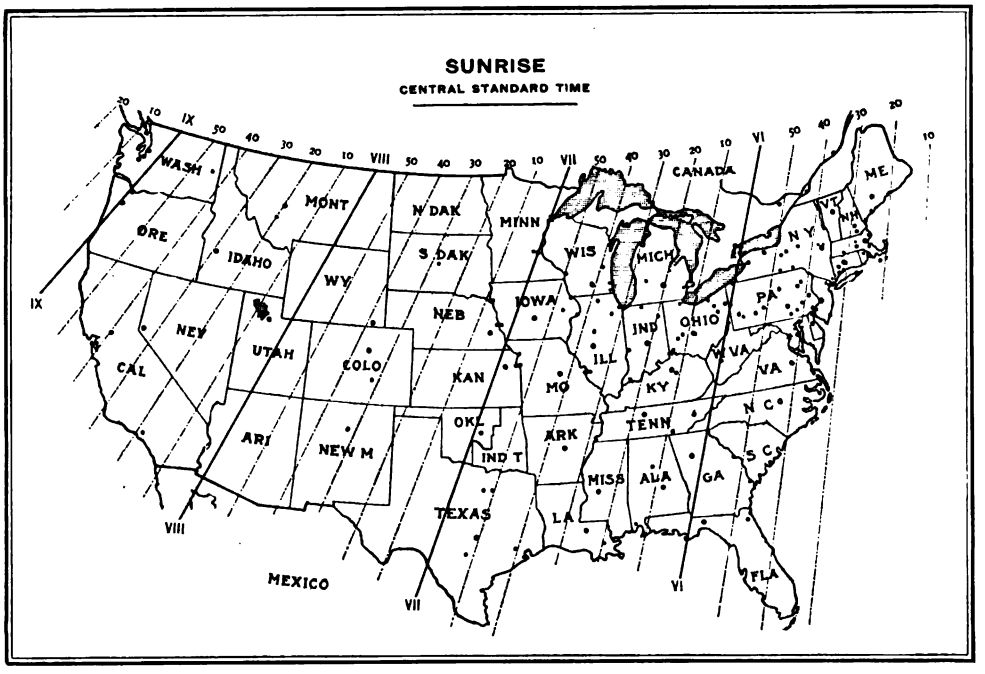


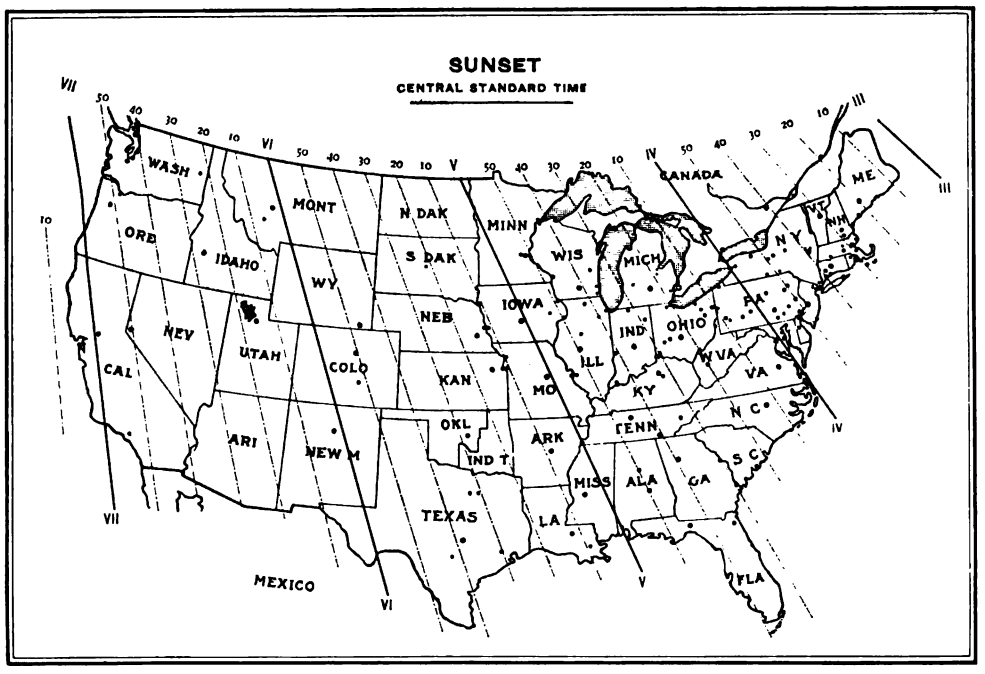
NOVEMBER FIRST





NOVEMBER NINTH





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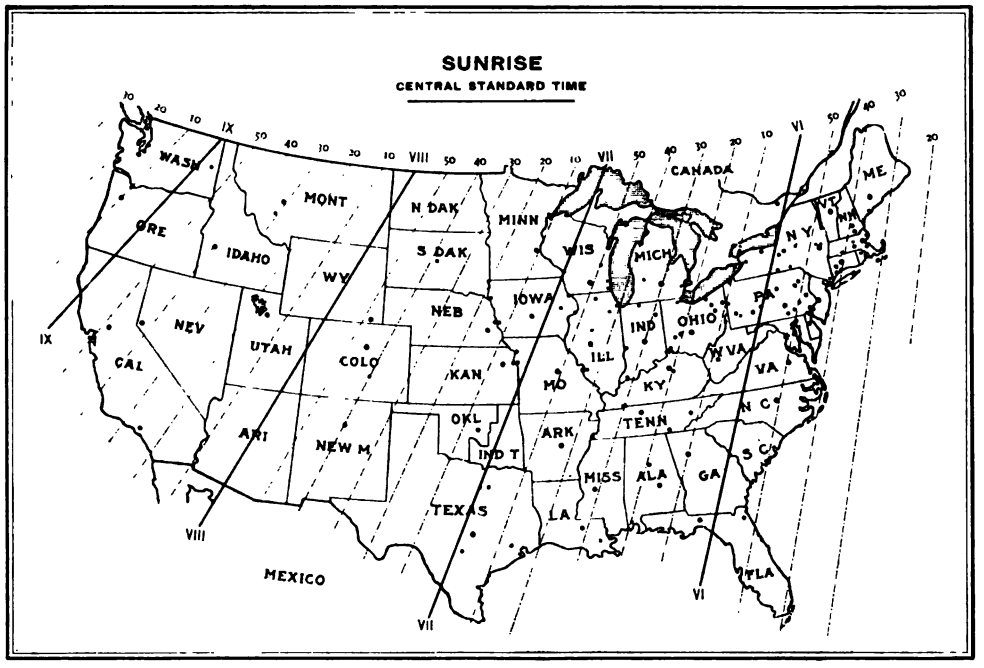

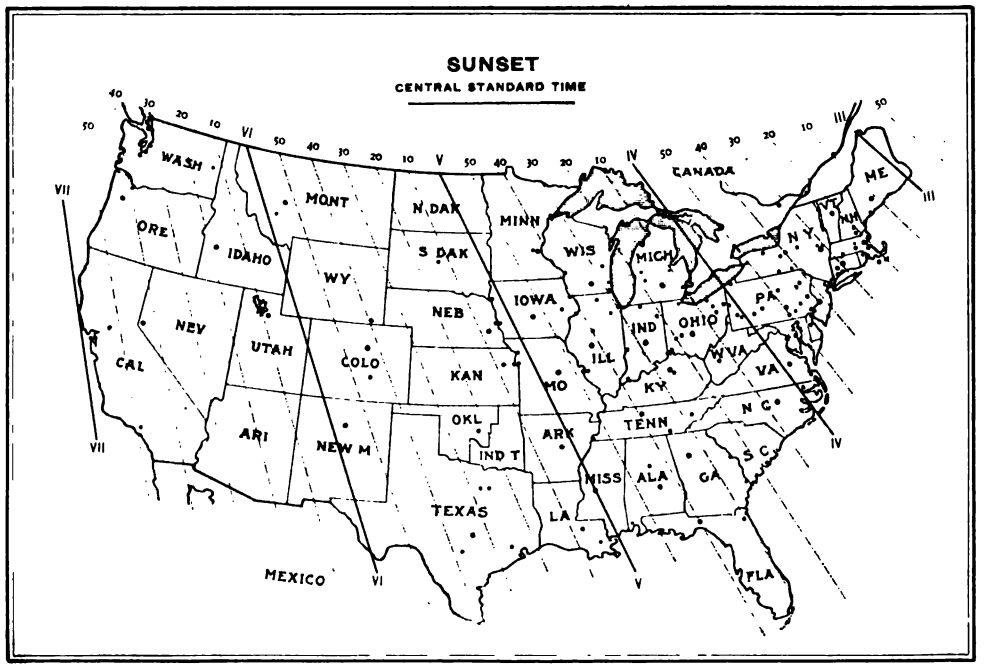

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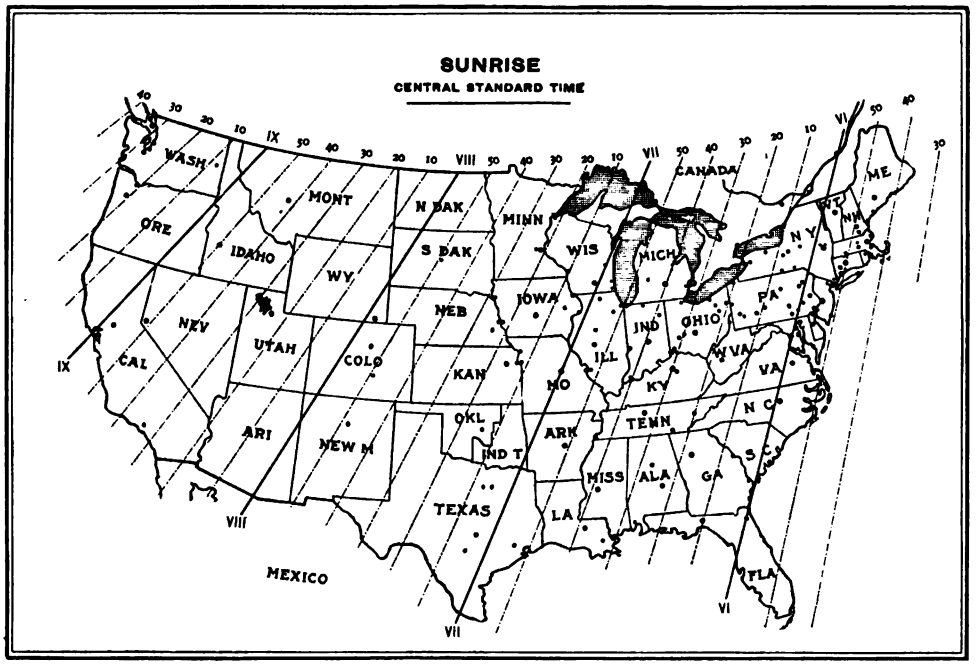

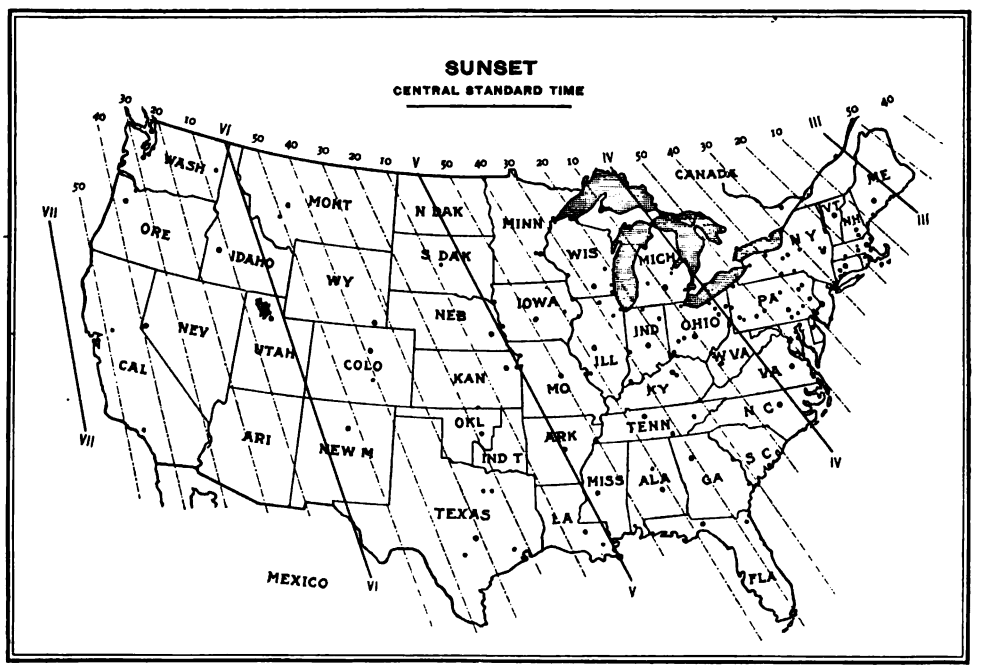

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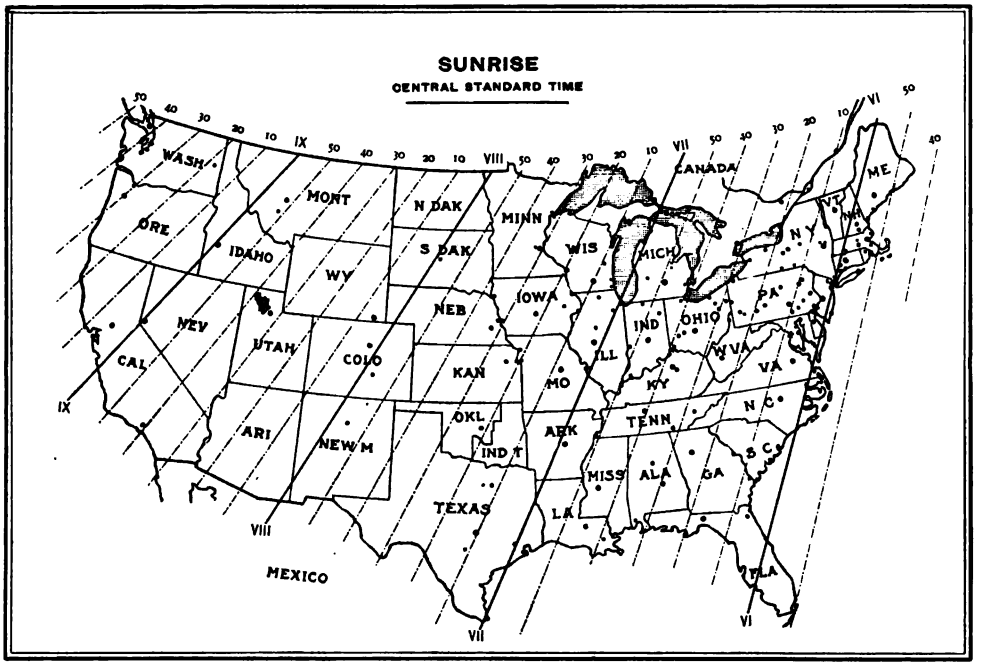

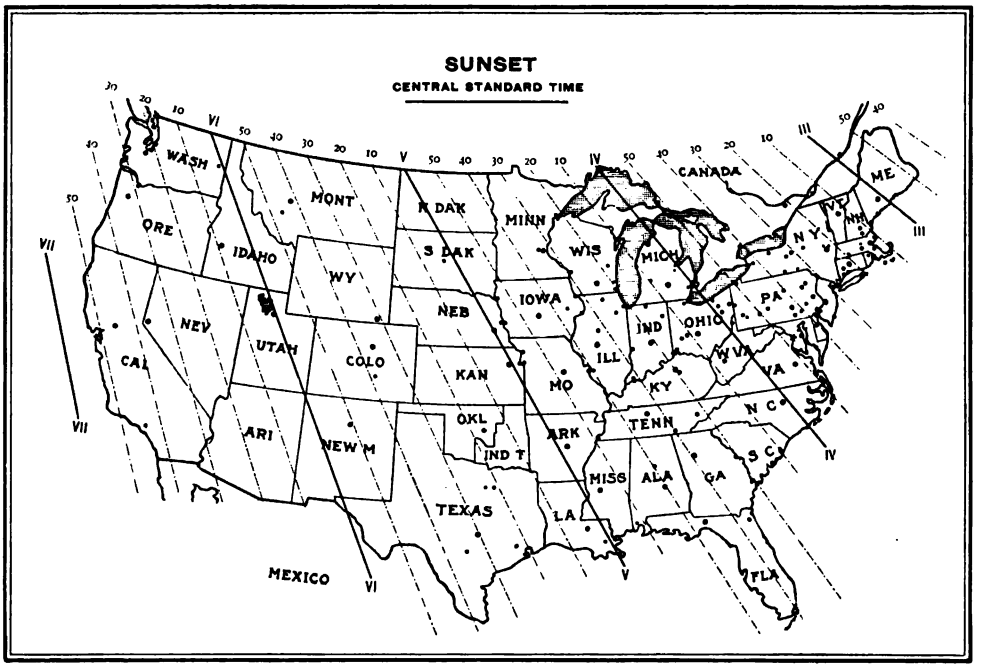

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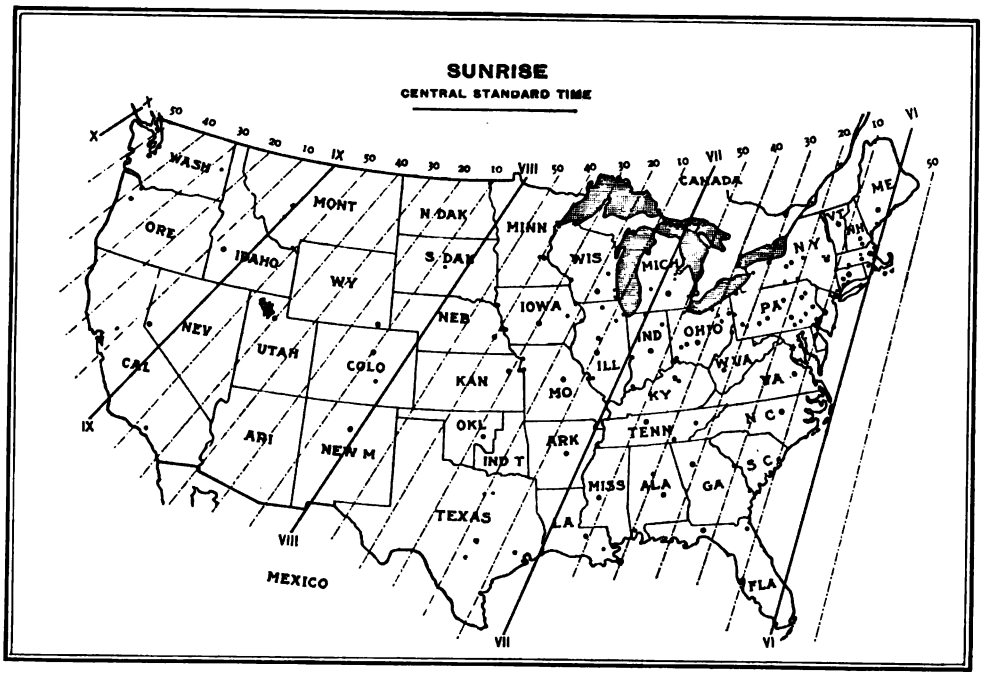

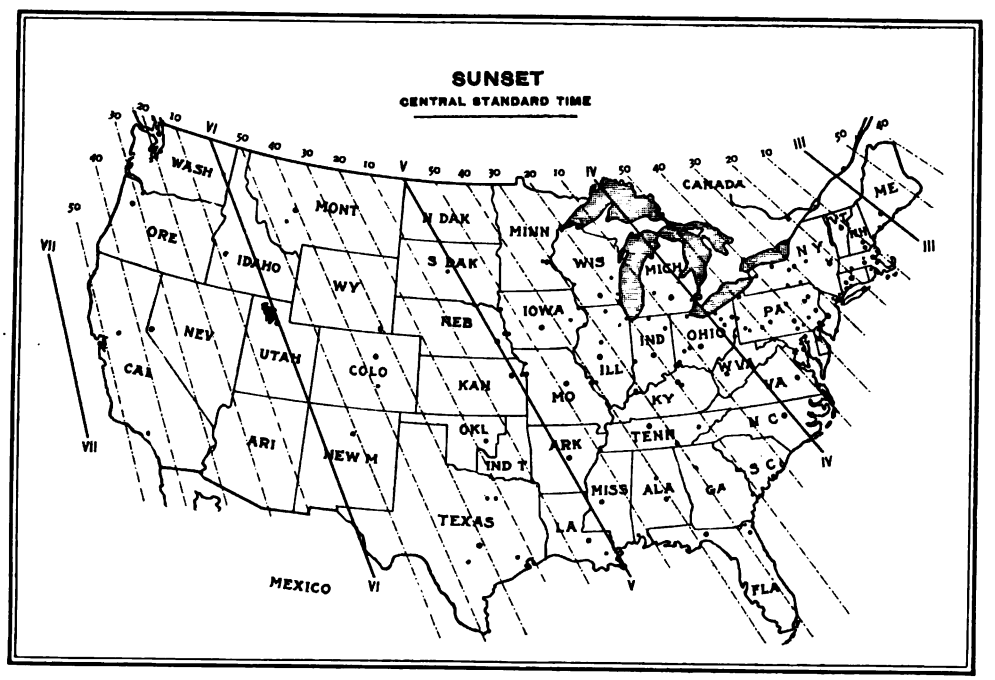

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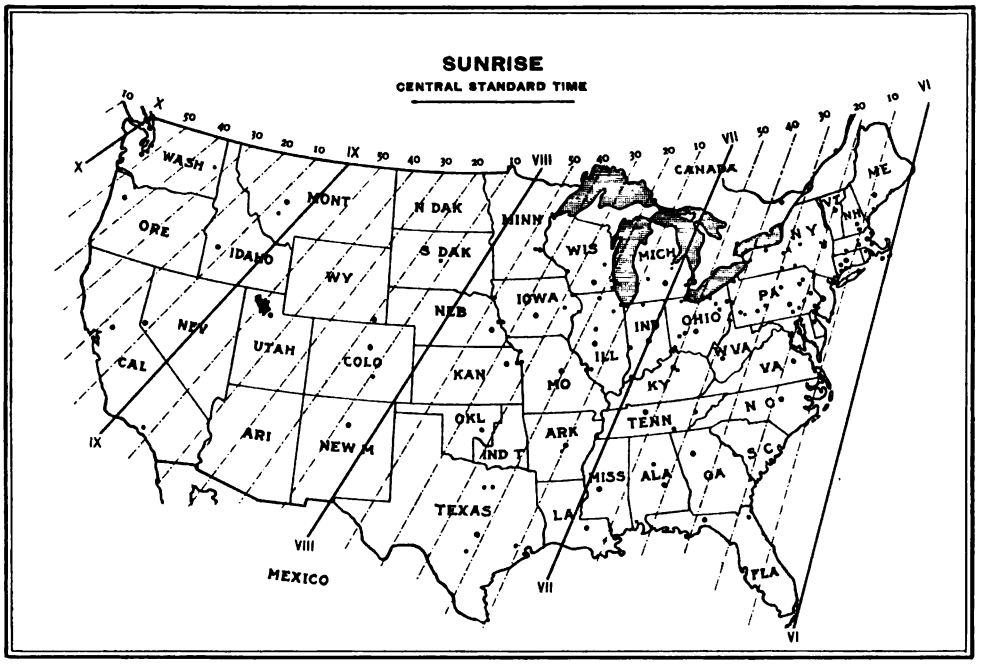

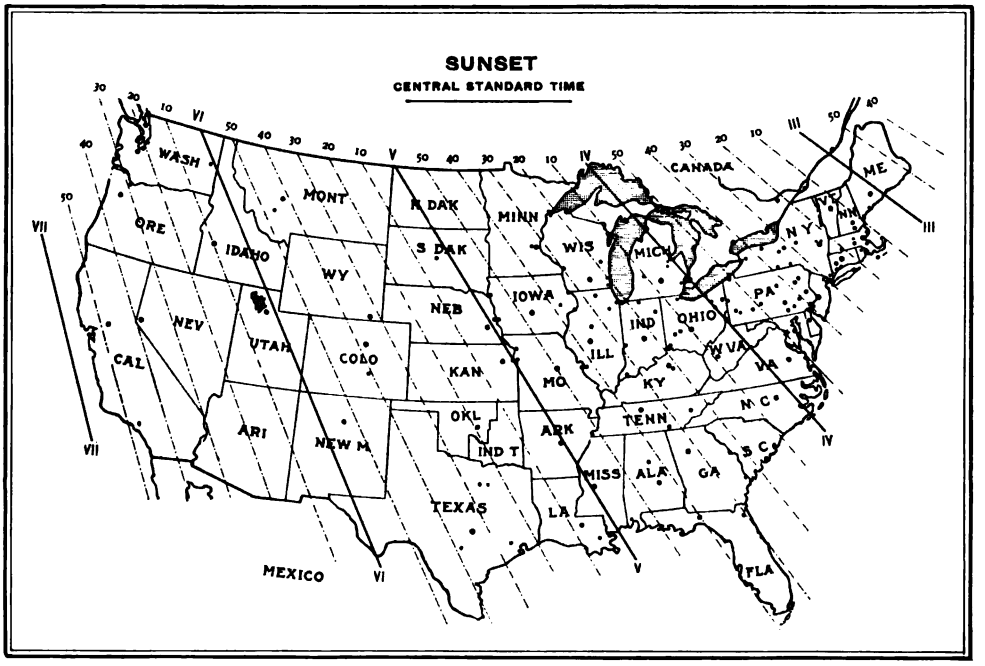

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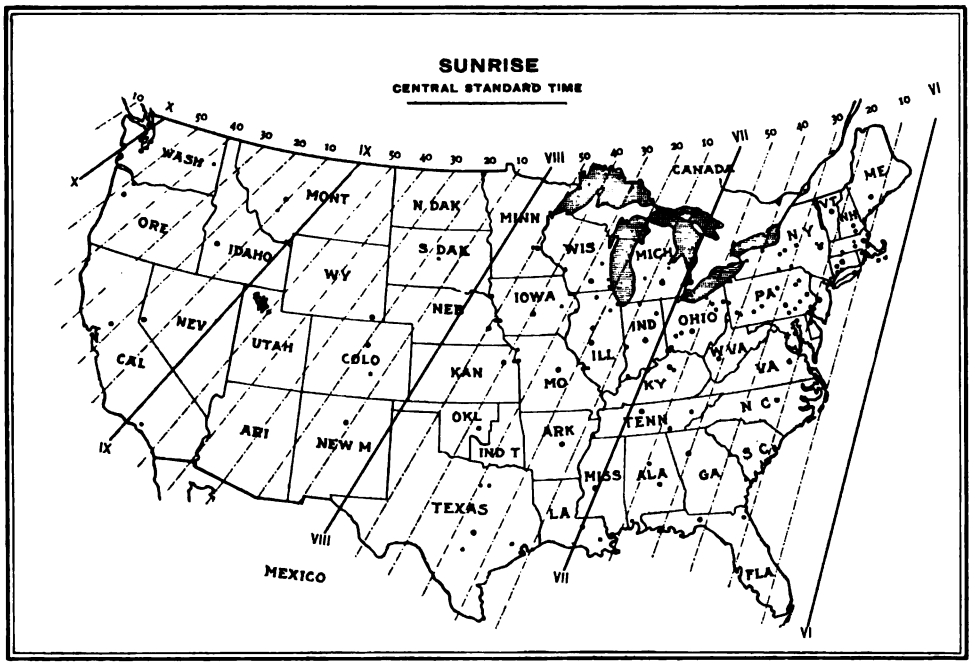

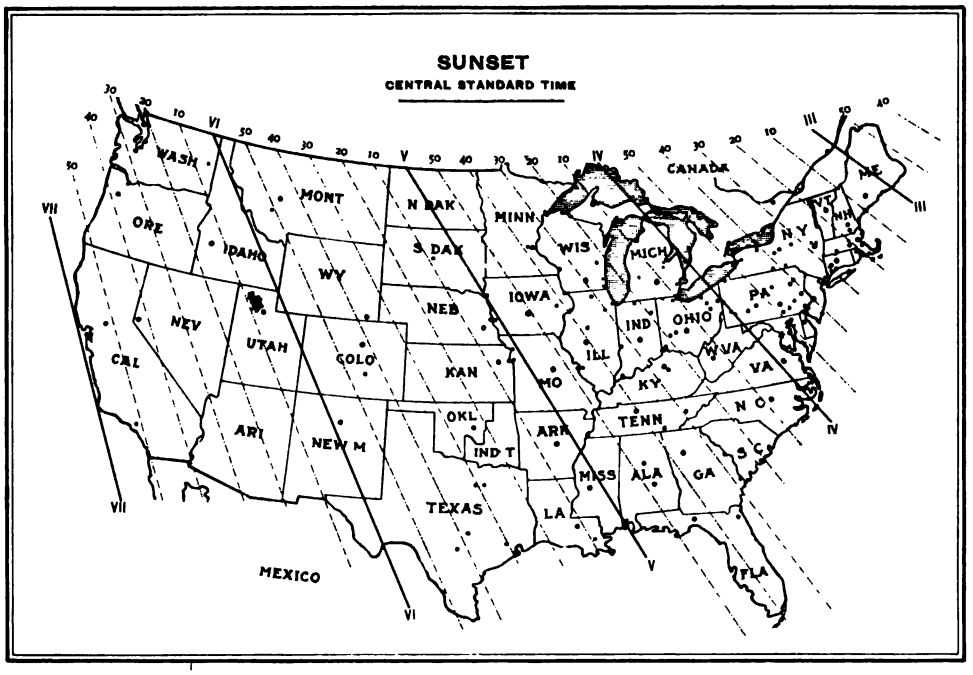

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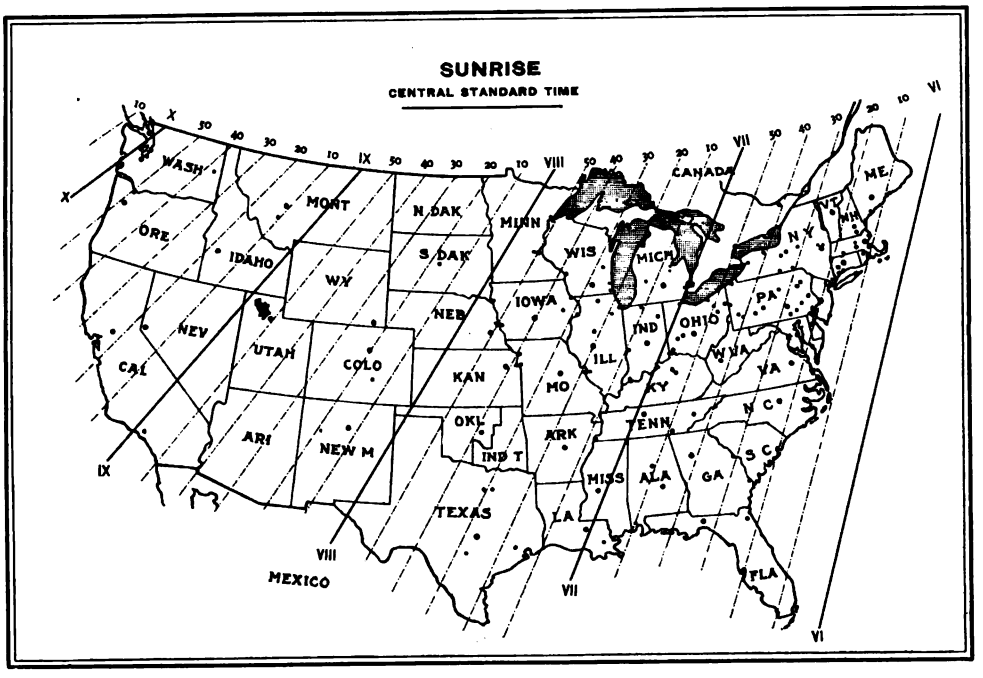
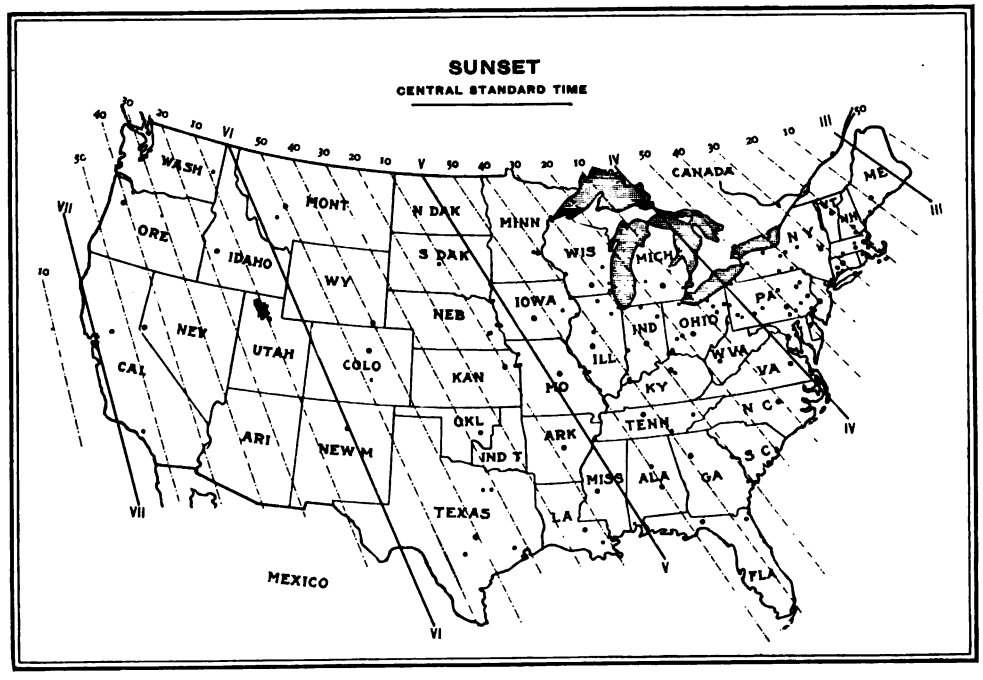
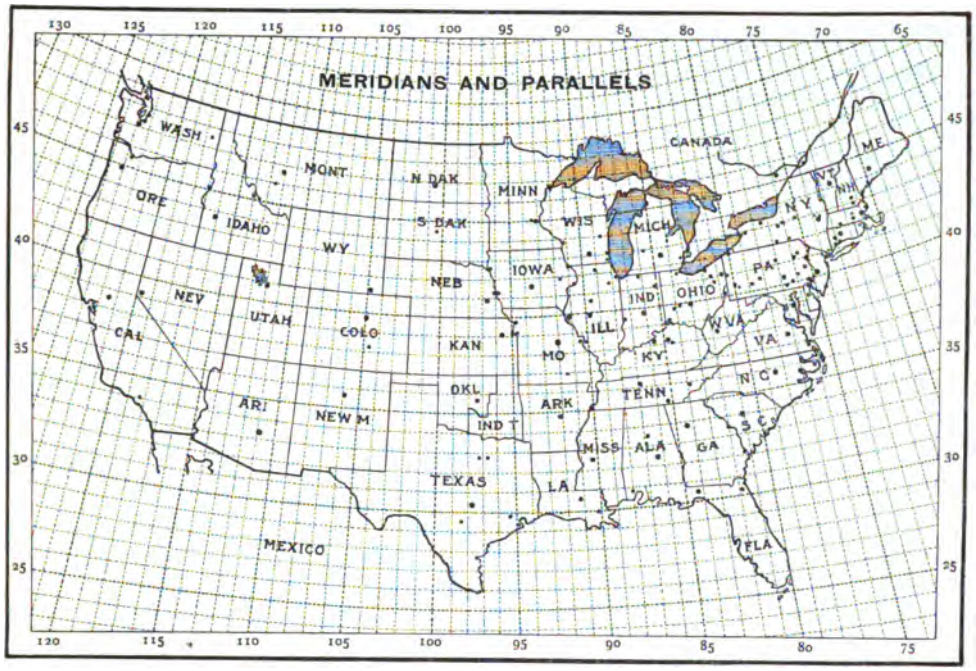
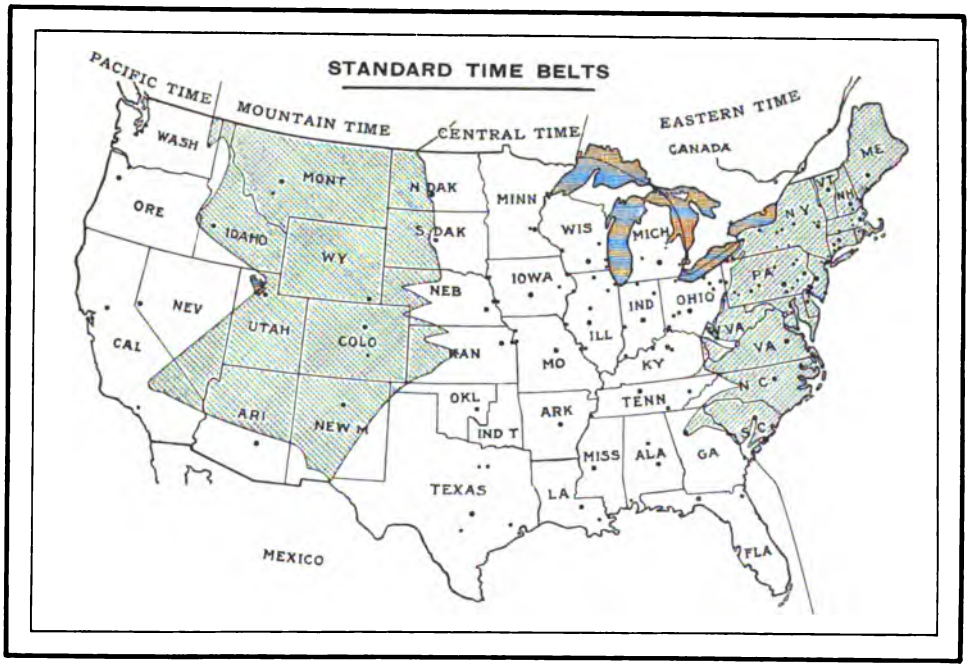




Auxiliary Maps





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